Successful Orchid Culture

262

SUCCESSFUL
Orchid Culture

P. R. C. RITTERSHAUSEN

LONDON: W. H. AND L. COLLINGRIDGE LTD
FLORIDA: TRANSATLANTIC ARTS INCORPORATED

TO MY SON BRIAN

635.93415
R515S

ALLAMA IQBAL LIBRARY
51378

LIB.
51378
13.x.64

First published in 1953
by W. H. & L. Collingridge Ltd
Tavistock Street London WC2
and in the United States of America
by Transatlantic Arts Incorporated
Hollywood-by-the-Sea Florida
Printed in Great Britain by
The Shenval Press Limited
London, Hertford and Harlow

Reprinted 1954 and 1956
Revised edition 1961
© *Revised, P. R. C. Rittershausen 1961*

Contents

Introduction 9

1. ORCHID CULTIVATION

I. The Orchid Greenhouse 11
II. Routine Management 26
III. Routine Culture 35
IV. Propagation and Hybridization 53
V. Pests and Diseases 66

2. THE COOL HOUSE

VI. Cool House Monthly Notes 73
VII. Cool House Orchids 83

3. THE INTERMEDIATE HOUSE

VIII. Cultivation 109
IX. Intermediate House Monthly Notes 111
X. Intermediate House Orchids 117
List of Species, Hybrids and varieties 142
Index 146

Illustrations

LINE DRAWINGS

Building a greenhouse from breeze blocks 14
Fixing glazing bars 15
Arrangement of stagings and pipes 19
Layout of interior fittings of greenhouse 20
Shading with laths 31

PHOTOGRAPHS

Shading the greenhouse 17
Spraying overhead 17
The correct way to water 17
Repotting a Cymbidium 18, 23, 24
Removing and repotting Cymbidium back bulbs 33, 34
Sections of Dendrobium bulbs potted up 34
Scale insects 39
Thrips damage 39
Red spider symptoms 39
Slug damage 39
Fumigating the greenhouse 40
Spraying with insecticide 40
Flask culture of orchid seedlings 40
Cymbidium 'Seaborne' 45
Cymbidium 'York' 45
Cymbidium 'Stourbridge' 45
Lycaste skinneri 46
An Odontioda 46
Odontoglossum grande (the Clown Orchid) 55
Odontoglossum rossii majus 55

Thunia gattonensis 56
Odontoglossum crispum 56
Dendrobium Ainsworthii (*aureum x nobile*) 61
Dendrobium thyrsiflorum 61
Dendrobium Austinii (Ainsworthii x Cybele) 62
Dendrobium fimbriatum 62
Epidendrum fragrans 79
Oncidium papilio (the Butterfly Orchid) 79
Cypripedium fairieanum 80
Cypripedium hirsutissimum 80
Miltonia 'Nadia' 97
Miltonia 'Cardinal' 97
Brassia brachiata 97
Cypripedium hybrids 98
Cypripedium Curtisii var. Sanderae 98
Coelogyne mooreana 115
Coelogyne cristata 115
Cattleya citrina 116
Cattleya labiata 116
Epidendrum obrienianum 121
Laeliocattleya 'Royal Crusader' 122
Laeliocattleya 'Miriam Marks' 122
Cypripedium 'Mist of the Moon' 131
Miltonia hybrids 131
Phalaenopsis 'Dingledon' 131
Selenipedium grande macrochilum giganteum 132

Introduction

I HAVE written this book mainly for those who have little or no knowledge of orchids, their habits, requirements and simple cultivation, and who may be considering growing a few of these plants for their own pleasure, or gradually building up a collection. They are most interesting plants, and their beautiful and exquisite flowers are among the most lovely in the world.

With these objects in view, I have written in as clear and simple language as possible, so that everyone may be able to understand, whether they have grown a few orchids before or not, and in the sincere hope that here many will find the answer to their difficulties.

At one time it was the general belief that orchids were most difficult plants to grow, but in reality they are among the easiest, once their simple requirements are understood. It seems that this mistaken belief has come about mainly by the mystery woven round orchids in the past and the extraordinarily high prices obtaining from time to time, giving the false impression that orchid growing was only for the wealthy, and beyond the means of the average amateur. Today the position is very different and every encouragement is given to foster an interest in orchid growing for the ordinary citizen, however modest his requirements.

Another fallacy is that orchids, because many of them in nature grow on trees, are parasites, like mistletoe. This is not so; no orchid is a parasite and where orchid species are found growing naturally on trees in the jungles and tropical forests, the roots will attach themselves to the bark solely for firm anchorage. Such plants live on the natural debris and humus lodged in the forks of the branches. It is Nature's fight for survival in the struggle for light, and explains why many orchid species or hybrids, under cultivation, attach themselves by the roots to the sides of the pots, when they grow over the edge of the rim. Cymbidiums, Cypripediums, Cattleyas and Dendrobiums are a few examples of this type.

There are three classes of orchid, those which can be grown in a cool house, those requiring intermediate treatment and those which require a warm or stove house. The latter are beyond the scope of this book, since the high temperatures required place them beyond the reach of the average purse. In this book therefore I have dealt with cool house orchids and with those for the intermediate house.

Not all orchids are beautiful, except the hybrids which often surpass the original species almost beyond recognition. Very many species are of botanical interest only and these have been omitted. The orchid species and hybrids described are those that will be of direct interest to the amateur grower. Such plants given reasonable culture will produce a fine display of mainly large, beautiful flowers, either in sprays or in single blooms, such as the Cypripediums. Many of them are particularly suitable as cut flowers and are long lasting, especially Cymbidiums and Odontoglossums. My aim is to place before the prospective grower a selection of fine orchids, which will give untold satisfaction and enjoyment, and a hobby which is both extremely interesting and profitable.

Using this book as a guide the newcomer to orchid growing will gradually master the elementary principles of the art and from this stage he may continue in his own way, adding to his collection and, by careful study of his plants, to his knowledge of orchids. This will teach him more than all the books can do, and he may then grow any other orchids that may take his fancy. Orchid growing is no different from any other branch of horticulture—it is never learnt, one simply becomes part of it. Every grower has his own pet ideas and this adds so greatly to the fun of it all. One golden rule must be observed whatever the temptation to break it—never attempt to grow any intermediate house orchid in the cool house or *vice versa*, it will only lead to disappointment.

Before proceeding to discuss the orchids themselves, the greenhouse, its heating system, and general management, are described, for it is often necessary for the prospective orchid grower to become a 'jack of all trades', doing his own maintenance, repairs, carpentry, bricklaying, glazing, engineering and stoking; all part of the joy of growing these wonderful plants. Added to this, there is the pleasure of enjoying one's hobby under cover in all weathers and the delight of seeing one's orchids in flower, when all is dormant in the garden outside during the winter.

Finally, before reading this book, the reader is exhorted to forget all about the difficulties he may have heard of in the past about orchid growing, for there is no reason whatsoever why he should not have every success with these plants, as with any other type of greenhouse plant. Gloxinias, streptocarpus, begonias, primulas, ferns, and others may all be grown with a mixed collection, and climbers such as stephanotis, *Hoya carnosa*, bougainvilleas, passifloras and the like, may be included, and even cacti will be happy with an orchid collection.

1. ORCHID CULTIVATION

CHAPTER ONE

The Orchid Greenhouse

ORCHID houses vary to a great extent, according to one's own particular circumstances and often consist of an ordinary amateur's greenhouse adapted for the culture of these fascinating plants. Any type of greenhouse may be used for the housing of orchids, which are most accommodating plants.

EXISTING STRUCTURES

Where an amateur already has a greenhouse, such as a lean-to, semi-span roof, or span roof type or a conservatory, it is an easy matter to adapt it for orchid growing. A lean-to house is quite suitable, except where such a structure faces due north and never gets any sunshine at all. Such houses would be more suitable for growing ferns. Other than this the aspect is not so important, although lean-to houses facing south are ideal, as are span roof greenhouses, running from south to north.

If a new greenhouse is to be constructed, then it is recommended that it should be as large as the available space will permit. There are two sound reasons for this. Firstly, it is more difficult to control the temperature in small greenhouses, both in summer and winter, for during summer they are liable to get extremely hot on bright sunny days, with a big drop in temperatures at night. During the winter months the opposite will occur, with the attendant difficulties of maintaining the even minimum required temperature. It is also difficult to maintain a correctly balanced humidity in the summer since atmospheric moisture is quickly lost through the ventilators having to be wide open in an endeavour to keep temperatures down. For the man who is away from home all day, these circumstances are not very encouraging. The second reason is that without doubt the time will arrive for the enthusiast when his collection of orchids has outgrown his house and he will be faced with the problem of either enlarging his greenhouse or erecting another, for he will find it unthinkable to dispose of any of his collection.

At one time all kinds of elaborate buildings, containing double staging above the hot water pipes, were erected for the culture of orchids. The lower staging consisted of slates or similar material, on which was placed a layer of gravel, shingle, breeze or similar material, to hold the moisture. Above this staging a second open staging made from wooden slats was erected, upon which the plants were placed. All these have been found to be quite unnecessary from a cultural point of view, and they harboured pests such as woodlice and slugs and needed frequent attention to keep them clean.

The only alteration which should be made to the average greenhouse is to dispense entirely with any side ventilation, by closing the side vents permanently. It is not necessary to put in any bottom ventilation under the staging level with the hot water pipes, as is often advocated; all that is required is ample top ventilation in the roof, at the ridge on either side of the greenhouse.

Having attended to the ventilation, attention should be directed to the staging. For ordinary purposes, most staging is of the wooden slat type, which is unsuitable for orchids. Where staging of this type is already in place it is advisable to cover it with asbestos sheeting, which may be easily cut to the size required. Asbestos sheeting is easier to cut when placed on the flat, by making a deep groove, using a linoleum knife and a straight-edged length of wood as a ruler, after which the asbestos will split readily as required. This method is better and quicker than attempting to cut the asbestos with an ordinary saw. Alternatively, there is a special tool available for cutting asbestos sheeting which may be purchased at any ironmongers.

Such staging with an asbestos covering ensures cleanliness and easy attention to the plants. Orchids grow well on them. There is no objection to standing the plants on inverted flower pots, in fact it is often advisable to do so, to ensure swift drainage and circulation of air round the plants and to enable efficient damping down to be done between the pots. It also helps to ensure that water does not inadvertently enter the plants. It will be seen that no shingle or gravel is required, nor is a double staging necessary.

As with most greenhouses an earth floor is necessary and where a cement or concrete floor already exists, it should be removed, leaving only the pathway. Ferns, *Begonia rex* varieties and other suitable plants may be grown in the ground under the front part of the staging, or helxine, commonly known as 'Peter's Pence', will give a pleasant green carpet with an added finish, and will also assist in conserving the moisture.

BUILDING A NEW GREENHOUSE

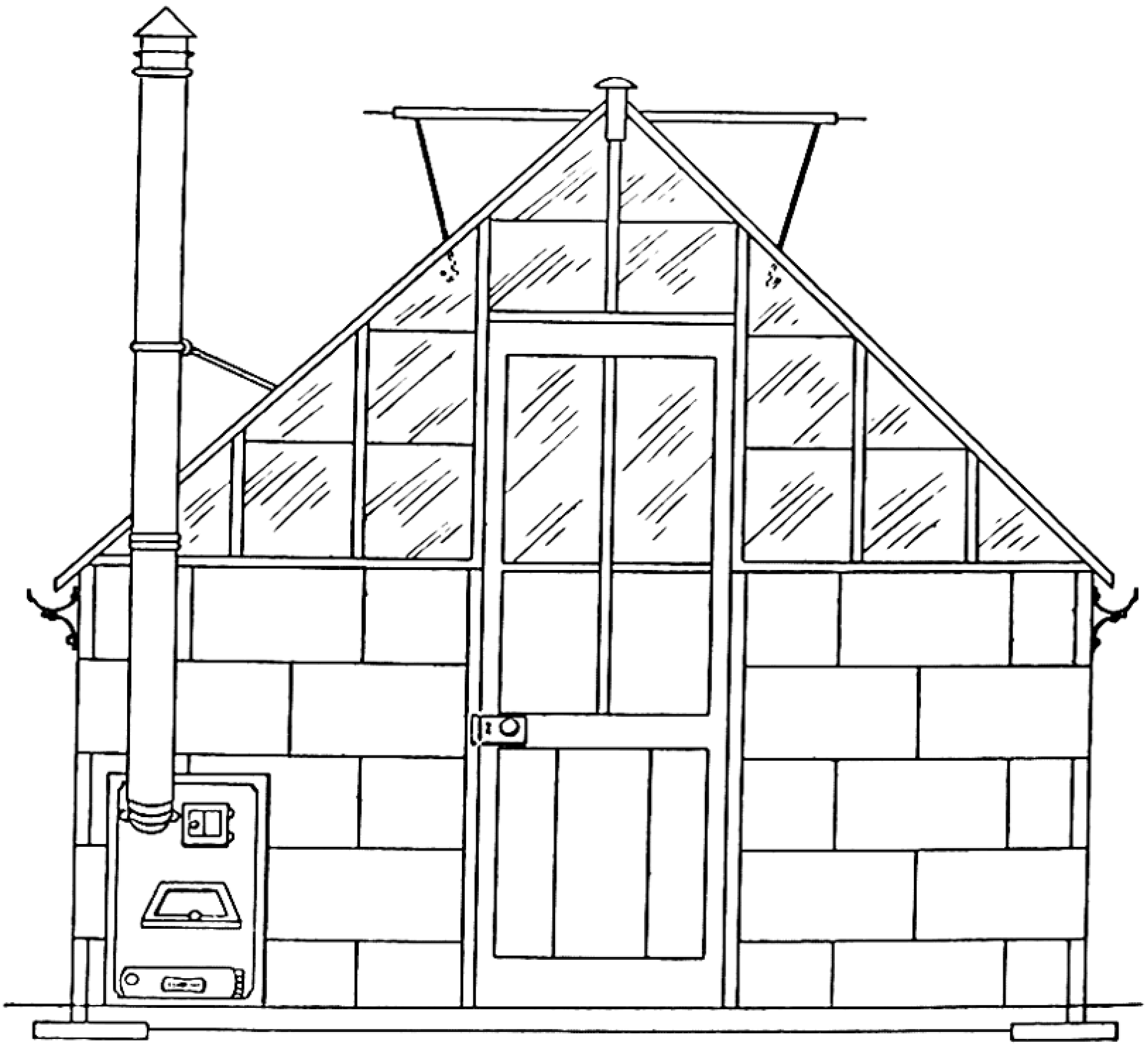
The amateur who has no greenhouse at his disposal and is desirous of growing orchids as a hobby, has the choice of either purchasing a greenhouse which manufacturers supply in sections and is easily erected by any handyman, making the modifications himself as mentioned above, or perhaps, better still, erecting his own and more permanent structure at far less cost. The construction of such a simple greenhouse is not difficult and is an achievement one may be justly proud of, but before either purchasing or attempting to build one's own greenhouse, it would be advisable to approach the local authority and ensure that the necessary licence will be granted. Having obtained this licence, let us consider the erection of a greenhouse, say, at the rear end of one's garden. The average suburban garden is about 20 feet in width, which will allow ample room for a greenhouse 12 feet or 15 feet long and 10 feet wide. The structure may, of course, be smaller or larger according to the space available.

Preparing the site

Having decided on the site on which to build the greenhouse, the first operation is to dig out a trench about 1 foot deep and 1 foot wide, all round the site, the size the greenhouse is to be, ramming the earth down as hard as possible at the bottom of the trench. In this trench put a 6-inch layer of concrete for the footings, inserting any old lengths of iron or iron piping for added strength, especially at the four corners. This concrete should consist of 1 part of Portland cement and 4 parts of gravel ballast, the whole thoroughly mixed together and not too wet and finally smoothed off with a trowel and levelled, using a spirit-level for the purpose. One word of warning; never do any concreting or cementing during frosty weather.

Building the walls

When these footings are complete allow the concrete to set hard, which should take about two days. Then stake out the four corners and connect them with string, ensuring that the two sides and ends are perfectly squared up. All is then ready for the erection of the walls which may be built of breeze blocks, 3 inches thick, using the strings to keep them



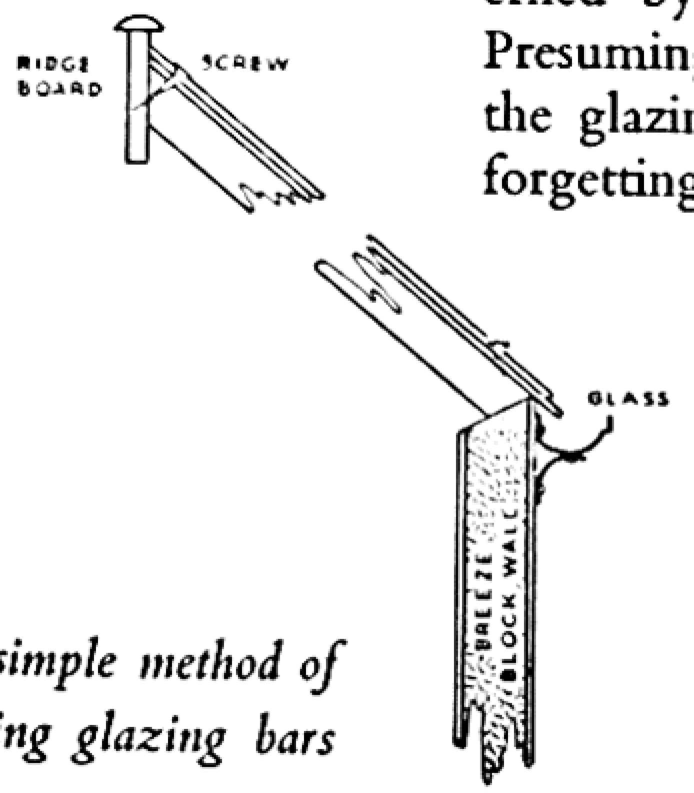
Front elevation of greenhouse showing arrangement of breeze blocks

straight. The walls should be about 5 feet 6 inches in height from ground level when completed. Remember to leave an opening at the north or northern-most end if possible, for the door and also a smaller opening for a boiler. Use a cement consisting of 1 part of Portland cement and 3 parts of sharp builder's sand for building the wall, the whole thoroughly well mixed. Finally check up the top level of the walls and face them with a layer of cement at an angle of about 45°, facing inwards. Upon this the glazing bars of the roof will rest. At the same time the insides of the four walls may be faced up smoothly with a thin layer of cement to complete the inside wall.

Erecting the roof

The next step is to erect the roof for which 3-inch glazing bars may be purchased already prepared. A ridge board about 8 inches deep and 1 inch thick, to which the glazing bars are screwed, will be required for the whole length of the greenhouse. Cut the glazing bars to the correct length and angle required and before erecting give all the timbers a double coating of Cuprinol, especially the ends which are to be joined. Cuprinol is harmless to plant life and on no account use creosote on any greenhouse work, the fumes given off are fatal to any plant life and persist for a long time. Apart from the door, which may be purchased ready made, other timber required will be some lengths of 3"×4", planed. This will be used for the uprights, to hold the ridge board and for the two ends of the greenhouse and will constitute the main strength of the building.

Having erected the ridge board with the ends fixed, the glazing bars may then be fixed into position, the correct distance apart being governed by the size of the glass to be used. Presuming this is 18 inches by 24 inches, then the glazing bars will be 18 inches apart, not forgetting to allow for the groove in the bars upon which the glass will rest. A good plan is to cut a piece of wood 18¼ inches long to use as a gauge when erecting the glazing bars, thus allowing ⅛ inch each side for extra play and avoiding any unnecessary cutting and waste of glass when glazing. Screw the glazing bars in their correct positions on to the ridge board and spike the bottom end into the top of the wall; they should fit exactly on to the 45° angle made on the wall.



A simple method of fixing glazing bars

The two ends will now require filling in with glazing uprights using the same gauge, and the door placed and hinged into position. Many greenhouses have the door opening inwards, but I am of the opinion that it is better to have the door opening outwards, especially in small houses, where all available space is needed. Having thus got all the framework into position, the whole should be given two coats of good white lead undercoating paint, including the ventilators, which may be made to lie flush on the top of the glazing bars. For a house 12 feet long, three ventilators each side will be sufficient and four each side for a greenhouse 15 feet long. It is easier to glaze the ventilators before they are placed in position.

Glazing

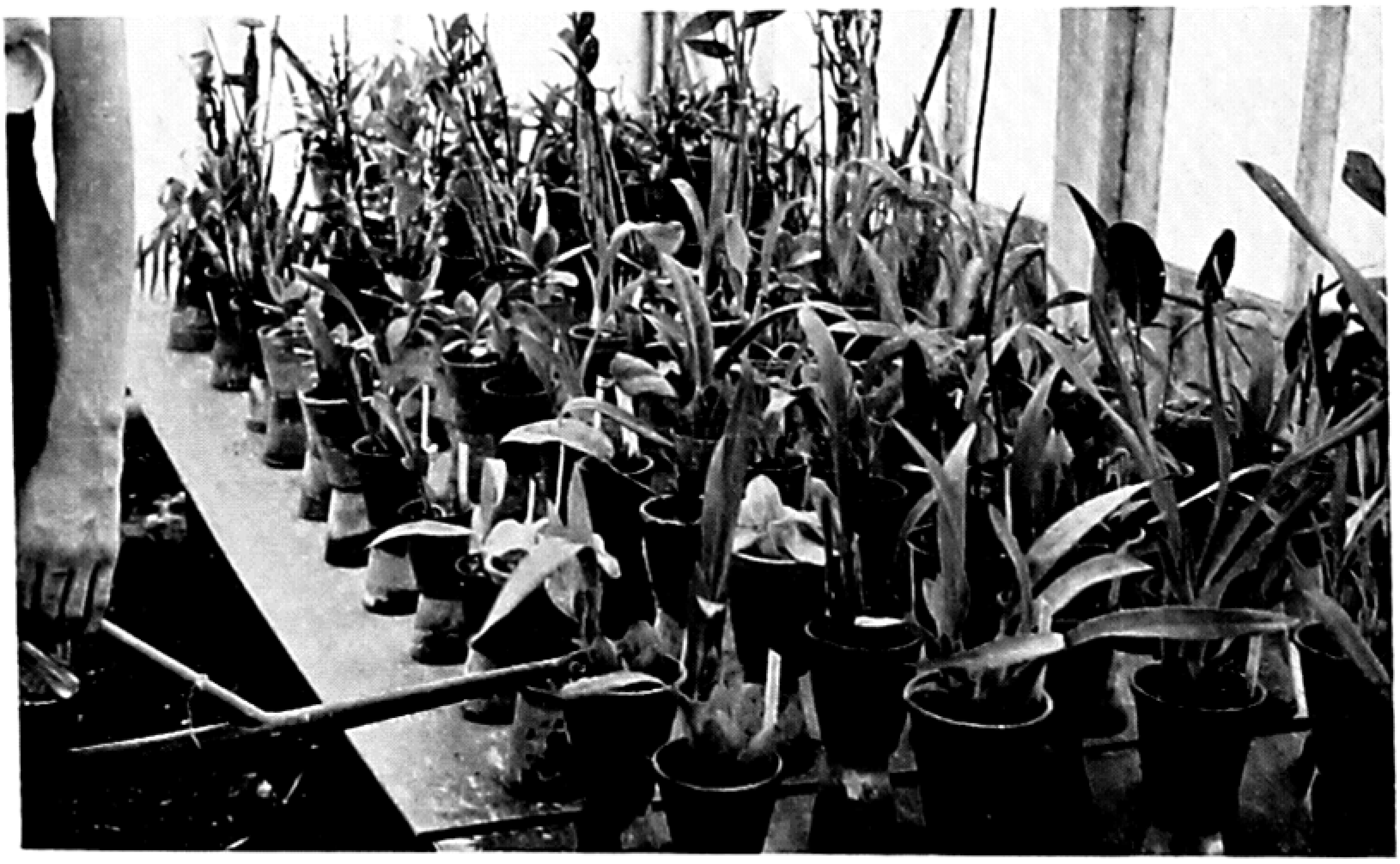
To glaze the roof start at one end of the greenhouse and continue working backwards, standing on a pair of steps inside the greenhouse, completing each panel as the work proceeds. Best quality putty only should be used, embedding the glass firmly into the putty and removing any surplus. The overlapping of the glass should not be more than about ⅜ inch and good horticultural 24 ounce glass should be used. In tacking the glass into position, care must be taken not to tack it in too tightly, or to force the glass into position in any way, otherwise it is very liable to crack near the tacks especially in frosty weather. Each piece of glass overlapping the next must lie flush upon the lower piece, no little gaps must be left, otherwise the greenhouse will be draughty and dirt will accumulate between the panes at the overlaps. At the two ends of the greenhouse each pane of glass may be placed standing flush upon the one below without any overlapping, and tacked into position.

For all practical purposes the house is now nearly completed and attention can be given to details such as the filling in of any cavities between the glass where it overlaps the wall at the eaves. These may be filled in with a little cement. To complete the job the outside wall may now be faced up with cement to hide the breeze blocks. Finally give all the woodwork a coat of white-lead finishing paint.

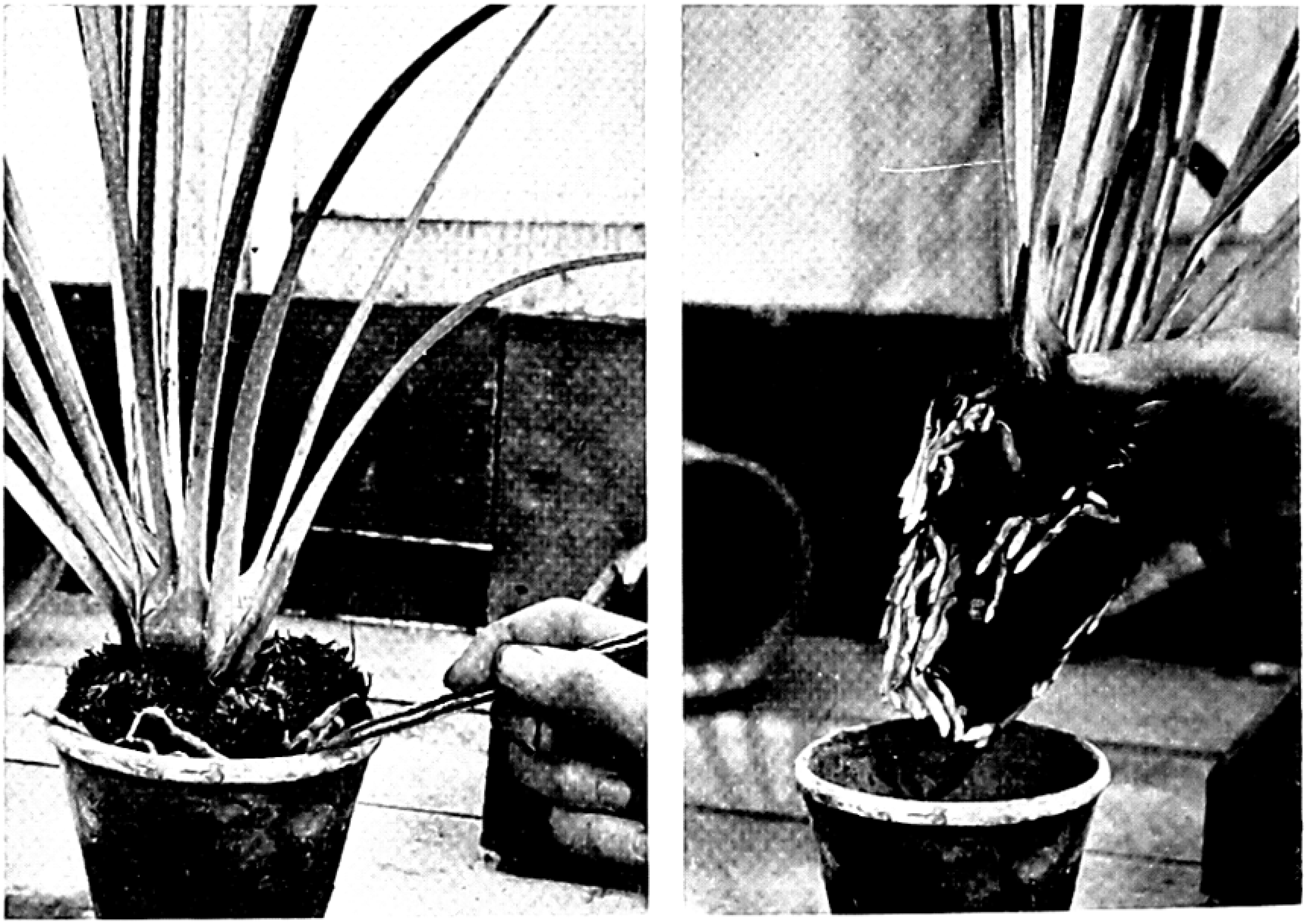
Installing the boiler

The next step is the installation of the boiler, presuming hot-water piping is to be used for heating. It is important that sufficient piping is installed to maintain an even temperature, but usually for a greenhouse such as we are considering, a flow and return system of 4-inch pipes, running the full length of both sides of the house, including the far end away from the door, is sufficient. The boiler itself should be placed in position, first standing it on a solid foundation to act as a hearth. Thus the base of the boiler will be a little above ground level, a protection against flooding in inclement weather. The front of the boiler should be as near flush as possible with the outside wall of the greenhouse, thus ensuring that the maximum heat given off by the body of the boiler itself is retained inside the greenhouse. The bottom 4-inch pipes leading from the boiler should not be less than 9 inches above the ground, to allow for ample air circulation round the pipes and the pipes must be installed so that they rise steadily round the greenhouse to the expansion box, according to the manufacturer's instructions. The top pipe is the flow from the boiler and the bottom pipe is the return to the boiler. The chimney should be

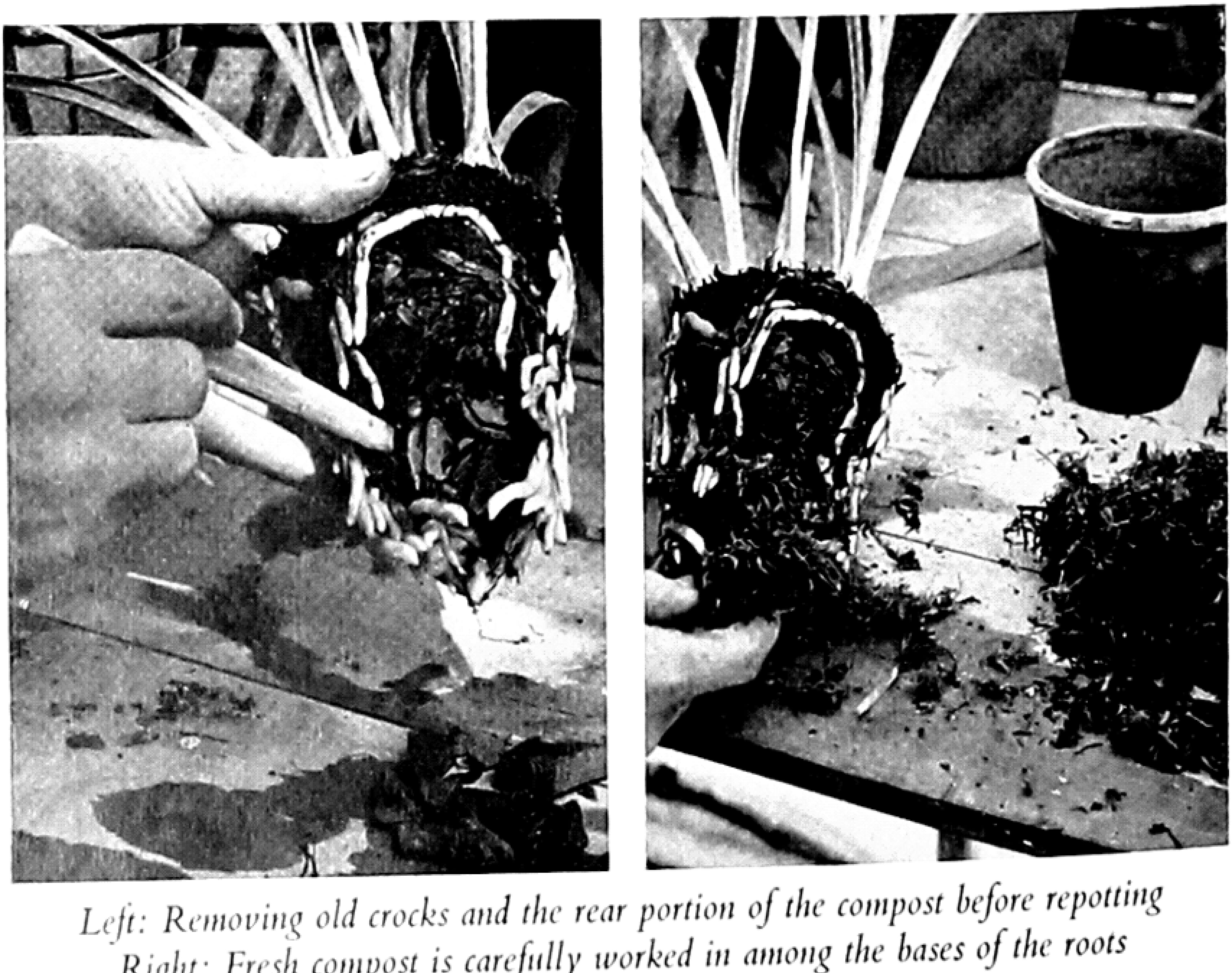
Left: Fixing wooden slats in position inside the greenhouse to provide shade
Right: During the summer months all orchids enjoy a light overhead spray



The correct way to water. Remove the rose, and water from the rim of the pot

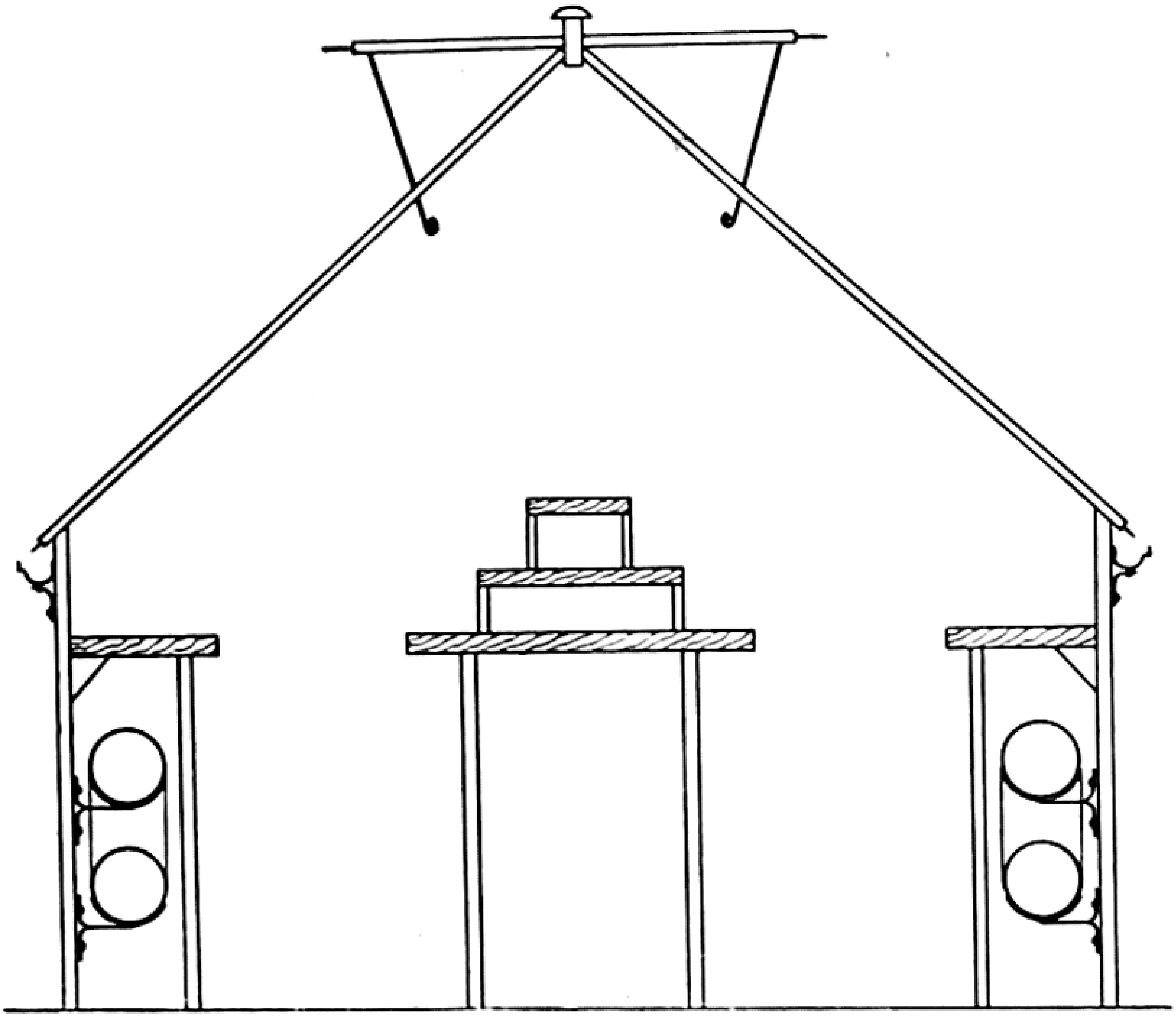


A Cymbidium to be repotted. The pot-bound roots in their search for food have grown down in the crocks, and have forced the plant above the rim of the pot



Left: Removing old crocks and the rear portion of the compost before repotting
Right: Fresh compost is carefully worked in among the bases of the roots

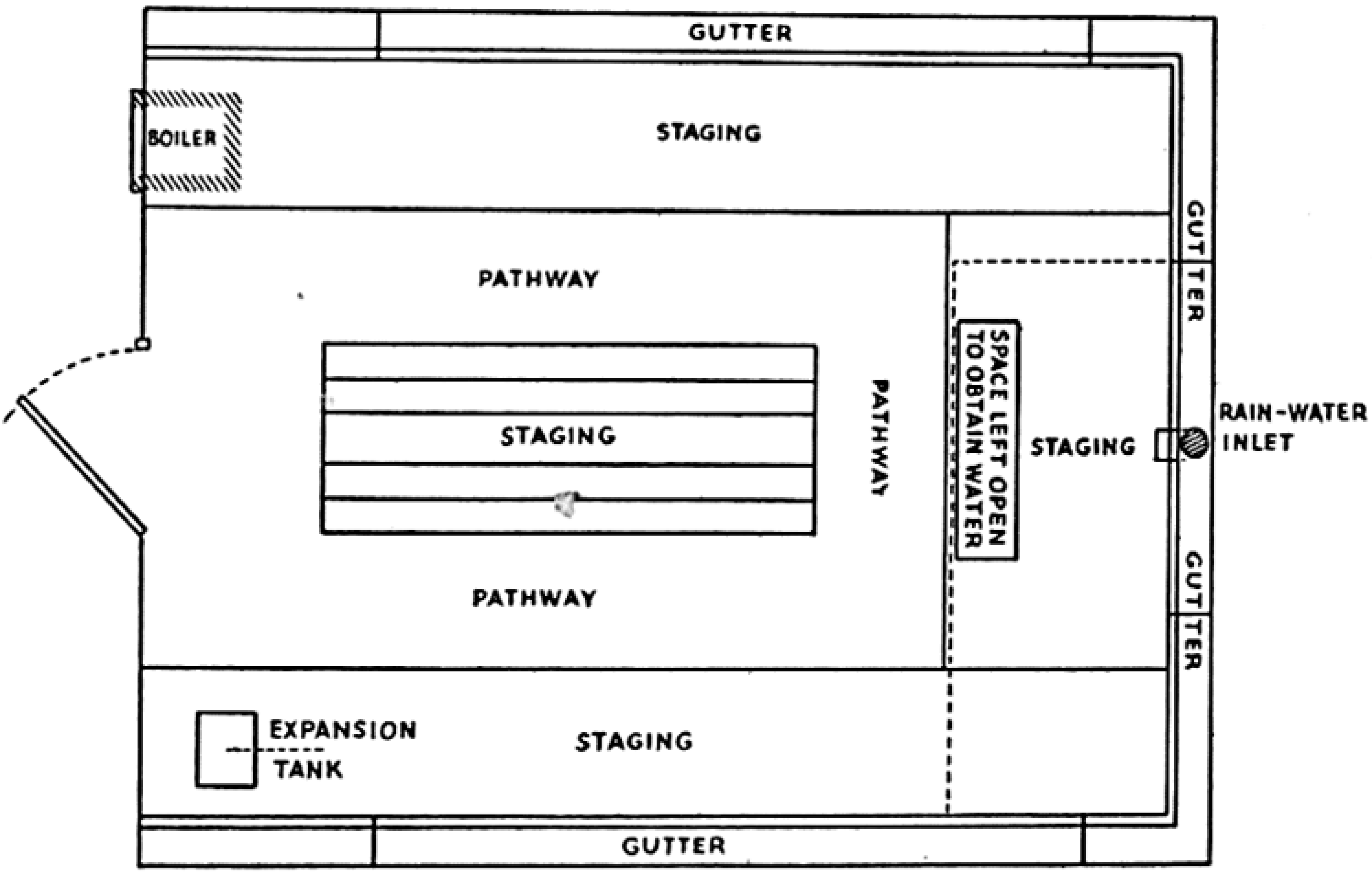
outside the greenhouse and high enough to allow for any fumes from the fire to be carried away, for should these fumes enter the greenhouse the plants will suffer. It is better to have an asbestos chimney rather than an iron one, which would be more liable to crack after a time and become rusted inside when not in use.



Front inside elevation of greenhouse showing arrangement of stagings and pipes

The staging

In a greenhouse 15 feet or more in length it is possible to erect a centre staging in addition to the two side stagings and the one at the end of the house. This layout is recommended, for it is very much more interesting to be able to walk round a greenhouse and study one's plants from both sides. This cannot be done where there is merely a path down the centre. Also, the taller orchids such as Cymbidiums, with their graceful spikes of large flowers, may be placed on the centre staging and the smaller plants such as Cypripediums and Odontoglossums may be placed on the two side stagings, and the end staging may be occupied by a more varied collection of orchids.



Plan of layout of interior fittings of greenhouse. The dotted line indicates position of rain-water tank under staging

The stagings need only be of asbestos sheeting, as already described, and they should be about 3 feet 6 inches from the ground. The centre staging may be 2 feet 4 inches wide, with the two side stagings each 15 inches wide. These two side stagings and the end one should be 1½ inches away from the wall, to allow a little warmed air to flow through and give a more even distribution of heat when the boiler is in use. These measurements for the stagings allow for a path 2 feet 5 inches wide round the house. The end staging may be 3 feet wide or more according to requirements and under this the rain-water tank may be accommodated, or the tank may be built in with breeze blocks faced with cement and an inlet made from the gutters placed outside the full length of the house, which will collect the rain and divert it into the tank.

Some provision should be made for a potting bench. A strong flap may be made and attached to the inside of the door, which may be put up or let down as required, thus avoiding the necessity for moving plants about to make room for the work of repotting.

It will be seen that economy in timber has been studied in the erection of this greenhouse and there are no side-lights, these being quite unnecessary for orchids, the risk of rotting timber and subsequent maintenance being accordingly reduced to the minimum. Such a house as this may be easily divided into two sections should the grower wish to grow both cool growing orchids and those of the intermediate class, simply by

Jammu & Kashmir University Library,
Accession No. 51378

erecting a glass partition in the greenhouse. Some alteration would, however, be necessary to the heating system, should this be decided upon.

HEATING

In considering the question of heating the greenhouse during the winter months, the amateur orchid grower has the choice of the following methods at his disposal, any of which will be found to be quite efficient and satisfactory when operated in the proper manner. He may use either oil, gas, electric or coke boilers to achieve his object.

Oil heaters

Let us, therefore, consider first the use of oil heaters of which there are many excellent makes on the market which certainly do all that is claimed for them, when manufacturer's instructions are followed. Such oil heaters are especially suitable for the smaller type of greenhouse, up to about 10 or 12 feet in length, and they are capable of maintaining a minimum temperature of 45°–50° in severe weather. These oil heaters usually consist of a paraffin lamp containing one or two burners capable of giving off a steady heat, and are connected to a hot-water container to distribute the warmth given off. Oil heaters may be obtained with either an ordinary type wick giving off a yellow flame, or with the circular type of wick giving a blue flame. This blue flame consumes more oxygen from the air than the ordinary type of burner and is, therefore, more economical in the use of paraffin, but it is important in small houses to ensure that there is sufficient ventilation in the greenhouse, otherwise the lamp is liable to go out, having used up all the oxygen in the air. This may be obviated by making a small pipe hole in the wall of the greenhouse near the heater, which should always be placed underneath the staging. If this is done, the blue flame heater is, perhaps, to be preferred. It is important to remember that such apparatus must be kept scrupulously clean to ensure that no odours are given off by the paraffin, also paraffin of the best quality only should be used and the wicks given frequent attention to ensure even and steady burning. If these points are carefully attended to this type of heater will give satisfaction and be quite easy to maintain with little trouble.

Gas heaters

For larger greenhouses gas heaters may be installed, connected to 4-inch piping and, as in all houses where orchids are grown, these pipes should run along both sides and the one end of the house with a return pipe from the expansion box. These gas heaters may be fitted with a thermostatic control, regulating the consumption of gas accordingly and set at the required minimum temperature, thus making for efficient control and economy in the consumption of fuel. Where gas is used great care must be taken to ensure that all fumes are carried well away from the greenhouse and that none are able to enter the house, otherwise damage to the orchids is bound to occur. This danger appears to be the chief objection to gas heating, for at the best it must be remembered that any form of artificial heating is contrary to nature, but is a necessity as a protection against frost, cold and damp weather which spell disaster to orchids.

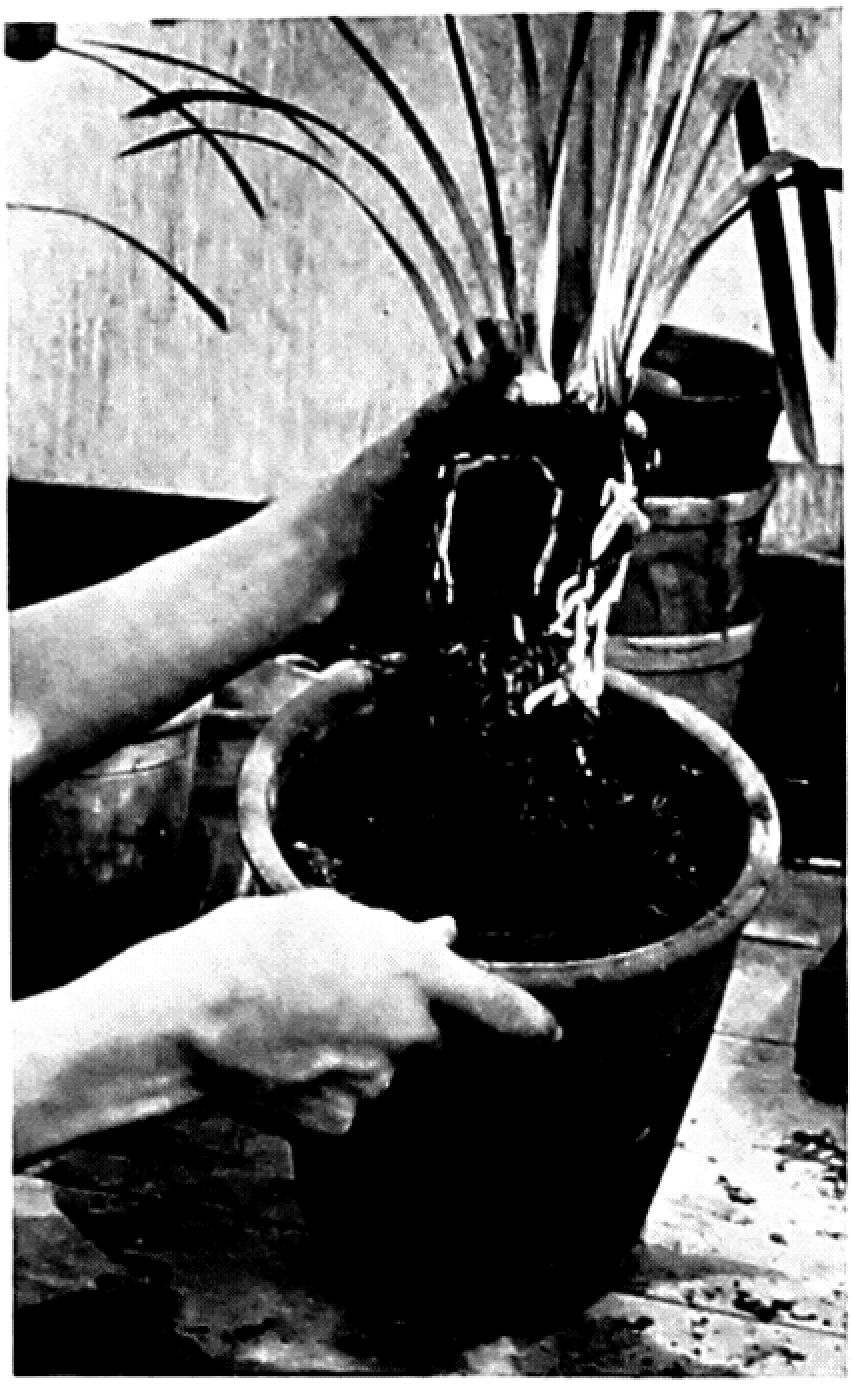
Electrical heaters

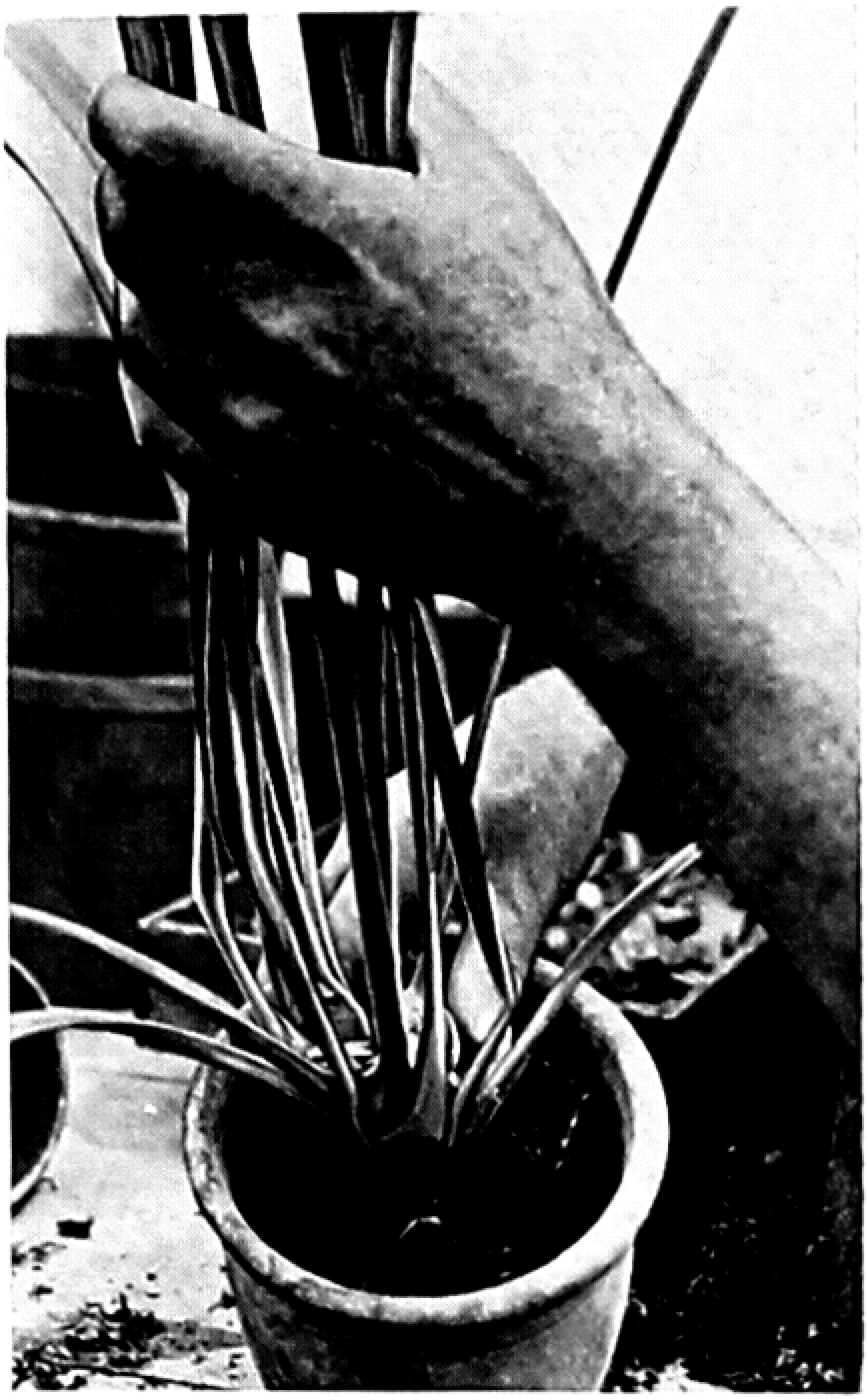
Electricity appears to be used more and more these days for the heating of medium-sized greenhouses and excellent results have been obtained by the use of it. Where thermostatic control is installed there is no doubt that for the grower away from home all day this method of atmospheric heating is greatly to be desired and reduces one's labours and running costs to a minimum, for as the temperature rises the current will automatically be switched off, coming on again as the temperature drops.

It is advisable to obtain the services of a reputable firm to instal the apparatus. Where 4-inch hot-water piping is already in existence an electric immersion heater can often be installed, which work should, of course, also be carried out by experienced electricians. The matter of electricity cuts need not be greatly feared, for these, when they occur, usually take place during the day time and would, therefore, not interfere with the installation during the night; even such cuts as are at present made are usually not long enough to allow the temperature of the greenhouse to drop abnormally low.

Coke and anthracite boilers

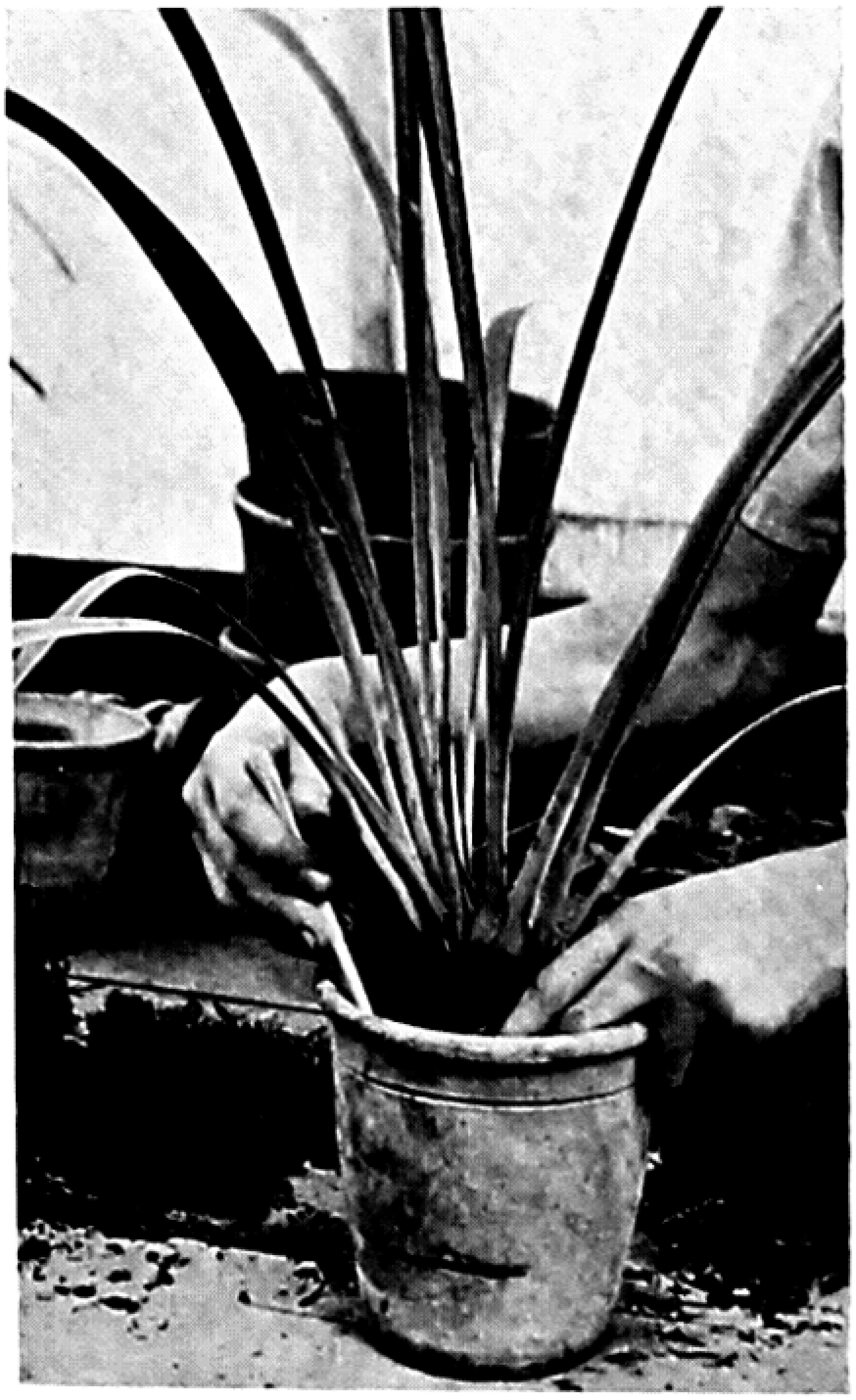
The coke or anthracite boiler, with its system of hot-water piping running round the house under the staging, has been in use for many years and superseded the old-fashioned hot-air-flue method of greenhouse heating. For larger houses this system of heating by hot-water pipes is still apparently the most satisfactory and economical. Boilers and installations may be purchased complete and ready for erection. For the average greenhouse a flow and return of 4-inch piping around the house is sufficient, 3-inch pipes being too small and, furthermore, should the boiler for any reason go out during the night, 4-inch pipes will retain



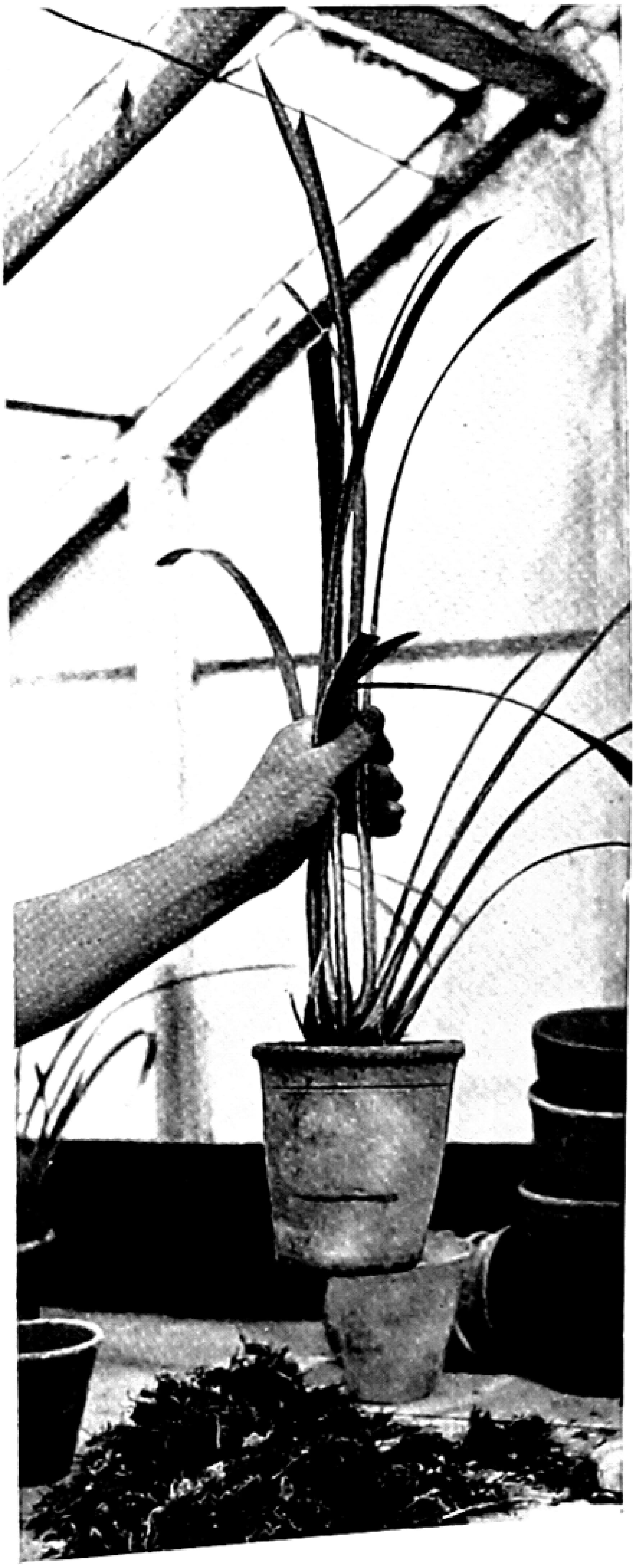


Above, left: Orchids should not be overpotted. The pot shown here is too large for the plant

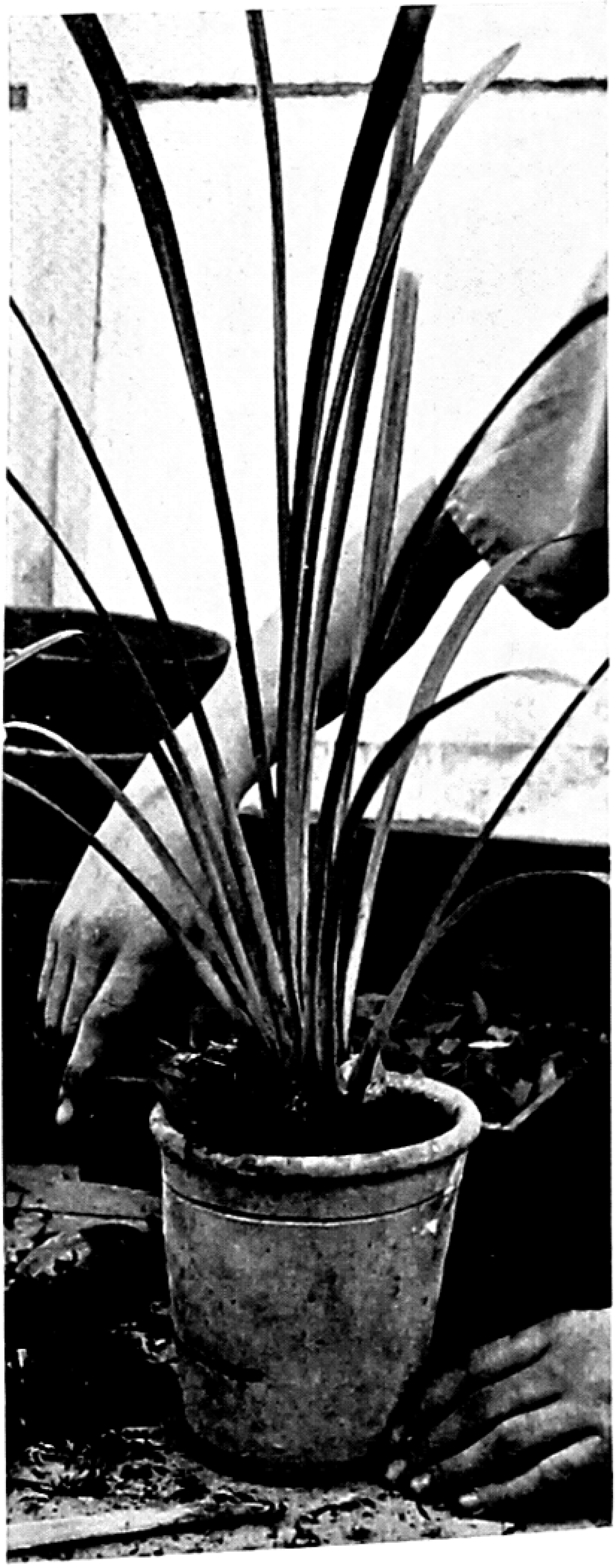
Above, right: Hold the plant firmly in position with its rear towards the side of the pot to allow for future forward growth



Right: Firm potting is essential. Using a potting stick to pack the compost well down into the crevices



Left: When the pot is well packed three parts full with new compost it should be possible to lift the plant by the leaves without the pot dropping off



Right: Finally all surplus compost is trimmed off and the potting stick is used to firm down the outer edge of the compost gently their warmth for a far longer period than 3-inch. It is as well to remember that the pipes should not be allowed to get so hot that it would not be possible to bear one's hand upon them for a minute or so. It is far better to let the temperature drop a little below the required minimum than to drive the fires too much and allow the pipes to get fiercely hot.

Thermometers

In conjunction with the heating system, whichever method is decided upon, it is important to make use of three reliable thermometers, hanging one near each end of the house and one in the centre, thus enabling the orchid grower to determine the conditions in the greenhouse at a glance. Incidentally one end of the greenhouse is usually warmer or cooler than the other by a degree or two. Such information enables a grower with a mixed collection of orchids to place his plants judiciously in their respective positions. It is an additional advantage if one of these instruments is a maximum and minimum thermometer, registering the lowest and highest temperatures obtained. These thermometers are particularly useful in checking the nightly temperature, and it can be readily seen whether any drop in the temperature has occurred during the night.

CHAPTER TWO

Routine Management

ATMOSPHERE AND HUMIDITY

ATMOSPHERIC moisture in the greenhouse is essential for the successful culture of orchids. To maintain this and produce good humid conditions, there is the routine process of what is termed 'damping down'. This is done by spraying water with a watering can, in small greenhouses, while in larger greenhouses a hose may be used. Water is sprayed against the walls, beneath the stagings, on the floors, paths and between the pots on the staging and in all corners, special care being taken to see that no water is allowed to get into the pots. This damping down produces the right atmospheric conditions for the welfare of the plants and it cannot be emphasized too much that it is one of the most important operations in orchid culture, far more so than the actual watering of the plants, for the orchids will absorb considerable moisture through their leaves and aerial roots. From this it may be readily understood that a dry atmosphere is most unsuitable for these plants.

Damping down should be carried out each morning, except during cold, wintry and windy weather when it is difficult to keep up the temperatures required. At such times as these it is better not to damp down or water the plants at all but to wait until the outside weather improves.

On dull wintry days one damping may be sufficient, but should the day turn out to be sunny with a consequent rise in temperature inside the house, a second damping down will be necessary in the early afternoon. This should not be carried out late in the day for most of the visible moisture should have dried before nightfall and there should be no visible moisture present on the staging, etc., by the next morning. During the spring and early summer, damping may be carried out more frequently, combined with additional ventilation, when there is an increase in the power of the sun, and on hot summer days damping down may be done three times a day, in the morning, the early afternoon and early in the evening, and at times the ventilators may be left open all night.

As the autumn approaches it will be necessary to see that the season's growth is sufficiently ripened and hardened to withstand the coming winter. To this end, damping down will be gradually reduced in frequency and more top air given according to the immediate weather conditions. On no account, at any time of the year, should any damping down be done in the morning until the prescribed minimum temperature has been reached, which in the cool house is 50° and in the intermediate house 55°. Remember also never to damp on a falling temperature. Where it is found that towards the latter part of the day the temperature is falling, damping down is better deferred for the rest of the day.

For obtaining this good atmospheric moisture, ordinary tap water will be used; reserving the rain-water for the actual watering of the plants. The plants are greatly benefited on warm sunny days by a moderate overhead spraying with a watering can or syringe, but here again care must be taken to ensure that all the foliage is dry overnight, otherwise any water lodging in the axils of the leaves overnight is likely to set up decay.

Evaporating troughs placed at intervals on the hot-water pipes, permitting a steady evaporation of the water in them, will be found to be of great assistance during the winter to the man away from home during the day and will prevent the air from getting too dry during his absence.

TEMPERATURES

In nature many orchids growing in their wild state are subjected at times to violent extremes of temperature, from frosts at night, to very hot sunny days. How is it then that under our glasshouse cultivation we have to apply artificial warmth, for experience has taught us that to allow the temperature to drop too often below a prescribed temperature will eventually result in the deterioration and loss of an orchid and that one night's frost entering the house will promptly kill the plants? The answer is that many orchid species flourish at high altitudes in the mountainous regions; sometimes 6,000 to 8,000 feet above sea level, where the air is very much thinner than at sea level. Under artificial cultivation, we may, with some success, practically imitate all the conditions under which orchids thrive, except this rarity of the atmosphere. Such orchids as Odontoglossums will, however, withstand slightly cooler growing conditions and are, therefore, called cool growing orchids for which a cool house is provided.

Other orchids, such as Cattleyas, coming from lower regions, growing in sub-tropical conditions, and not by nature subjected to frosts, require a warmer temperature all the year round and for these a section or a separate house, known as the intermediate house, is required. Most catalogues state to which class an orchid belongs, usually by a letter 'C' indicating cool house, letter 'I' indicating intermediate house, sometimes known as the Cattleya house, and the letter 'S' indicating stove house or East India house, for orchids requiring still more artificial heat nearly the whole year round. It is for this reason that orchids for the stove house are omitted from this book, for the fuel bill for such houses is no doubt beyond the purse of the amateur. Nevertheless, a few orchids are mentioned in this book which should be grown in the warm house, but for which a place may be found at the warmest end of the intermediate section. Similarly, a few of the intermediate section, such as *Cattleya labiata*, may be placed in the warmest end of the cool house, but a cool house orchid cannot be grown in the intermediate house, conditions being too warm for it. Hence it will be readily understood that where an amateur has only one house or section at his disposal, the choice of the type of orchid to grow must be left entirely to his discretion, for he cannot expect to succeed by mixing both cool growing and intermediate growing orchids in the same house; one or the other is bound to fail, to the detriment of both.

There is no doubt that among the cool growing orchids the amateur has the choice of very beautiful flowers and they are among the easiest for the average man to attend to, if his time and money are limited. Fuel consumption is no more than is required for any greenhouse often filled with a nondescript collection of plants.

The temperatures required for the cool house are shown in the table on page 29. An occasional drop of a few degrees will do no harm, provided the atmosphere is not heavily charged with moisture. The temperatures are, of course, only approximate and rather than have the hot-water pipes excessively hot it is better to have a slightly lower temperature in the house during a winter night, for with severe weather outside it is not always easy to maintain the prescribed minimum temperature. Again, during the summer time, temperatures will often greatly exceed the required temperature, and this, with extra damping down to maintain a moist atmosphere, is greatly to the benefit of the plants. When the temperature reaches 85° or 90°, additional shading and more ventilation should be provided to keep down any excessive heat.

In most districts artificial heating will usually be required for the cool house from about the end of September or the beginning of October until all danger of frosts is over by about the middle of May. There will, of course, be mild periods when fire heat may be dispensed with altogether and it will often only be required at night.

AVERAGE COOL HOUSE TEMPERATURES (FAHRENHEIT)

	Night	*Morning*	*Dull day*	*Sunny weather*
Spring	50°	50°–55°	55°–58°	60° and over
Summer	50°–55°	55°–60°	60°–65°	75° and low as possible
Autumn	50°–55°	55°–60°	58°–60°	65° and over
Winter	45°–50°	50°	50°–55°	60° and over

In the cool house such orchids as Masdevallias, Odontiodas, Odontoglossums, green-leaved Cypripediums, some Dendrobiums, Cymbidiums, some Oncidiums and the like, may be successfully grown.

If for any unforeseen reason, such as sudden changes in the outside weather, or falls in outside temperature, mostly at night times, the inside temperature of the house will be affected accordingly. Should the inside temperature drop to a dangerous level it is a mistake to drive the fires to get the hot water pipes excessively hot. When such falls occur, it is a safer plan to cover the house with garden mats or similar material, allowing the temperature to rise steadily to the proper figure. Where lath or roller blinds are in use they will be found to be an added protection during cold wintry weather if left in position overnight.

VENTILATION

As most orchids originate from the hilly countries where pure fresh air abounds, it is obvious that the question of ventilation in the greenhouse is of major importance in their culture. However no hard-and-fast rules can apply and ventilation must have the continued considered attention of the grower at all times of the year, in accordance with the aspect, situation, size, immediate weather and other points relating to one's own particular greenhouse. Nevertheless it is possible to give the following hints which may be taken as a general guide.

Fresh air is vital to the successful culture of orchids, but draughts must be avoided at all times; therefore, before any ventilators are opened the grower should ascertain the direction of the wind and open the top ventilators on the opposite side of the house from which the wind is blowing. The top ventilators must never be opened widely in an haphazard manner and air should only be given gradually, a little at a time, thus gently freshening up the atmosphere inside the greenhouse without causing any sudden fall of temperature. Naturally, more frequent ventilation may be given to the cool house section of orchids than the intermediate house with its warmer atmosphere.

During winter, on cold and frosty days and nights, no ventilation will be possible. On such occasions it is better to keep conditions in the greenhouse quiet and comfortable, giving a little air as soon as weather conditions permit, without reducing the temperatures below those prescribed for the time of the year. But on dull clammy days, such as we often experience, with little wind, top ventilation may be given to advantage, and of course ventilation may be increased in bright sunny periods.

During the spring more opportunities will occur and often gentle ventilation may be left on all day, closing the house early in the afternoon to conserve the natural sun heat as much as possible. Later, as the days lengthen, and during summer, considerably more air should be given in accordance with the daily damping down and often the ventilators may be left open all night, much to the benefit of the plants. There are many warm nights during the autumn when more air may be given, assisting considerably in ripening the season's growth of the orchids.

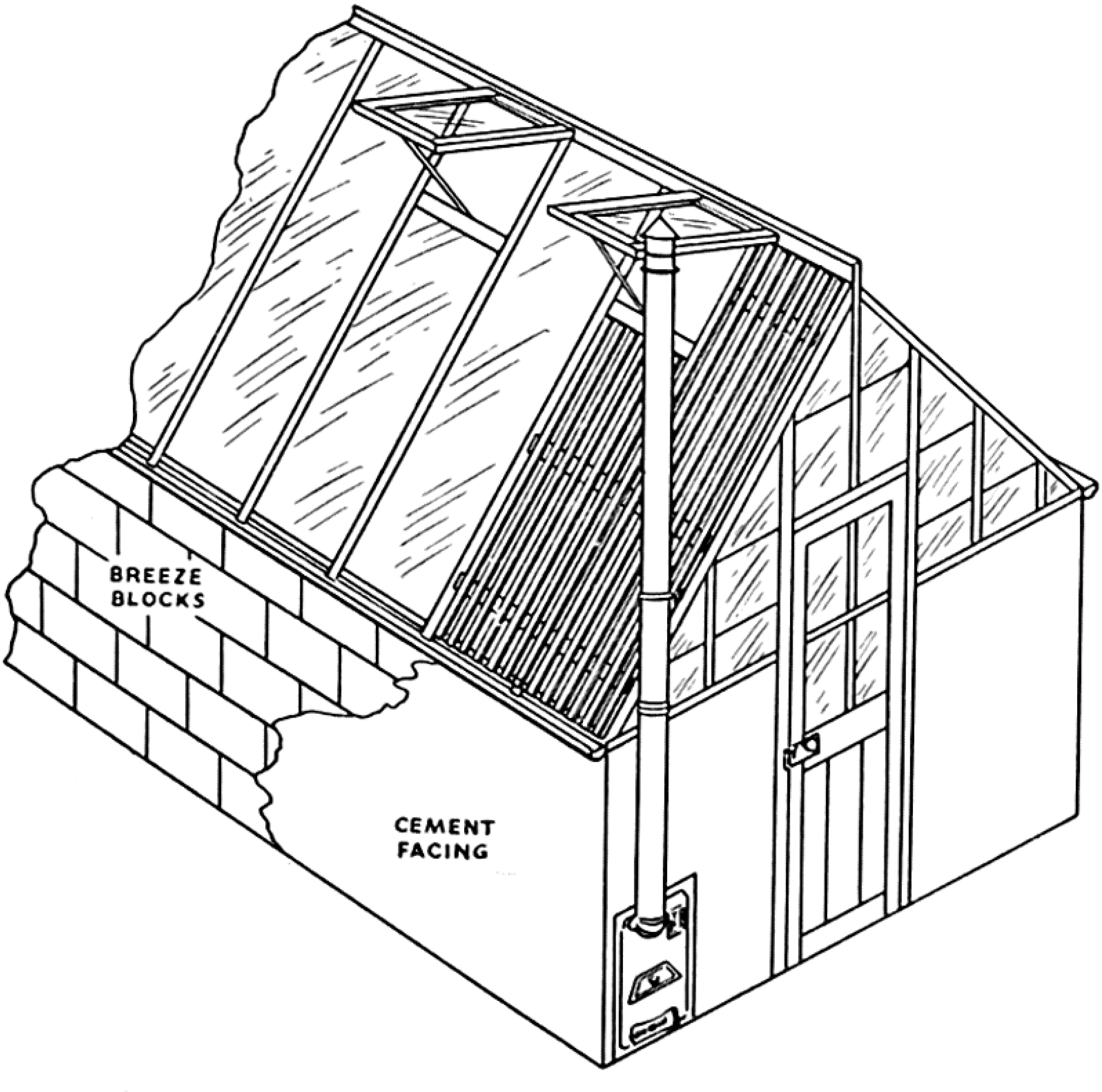
The chief points to remember when giving ventilation, which should be done at all favourable opportunities, are that atmospheric moisture should not be lost too rapidly and that temperatures should not be allowed to drop below the prescribed minimum. During the height of summer full ventilation may be necessary to assist in keeping temperatures from rising too high, when damping down is increased accordingly to maintain the balance of moisture in the air, in conjunction with whatever kind of shading is in use.

SHADING

There are many orchids which are shade-loving plants and others that are, in their natural conditions, exposed at times to the full sun, but in a greenhouse, conditions, however good, are not the same as those in nature. These plants cannot stand the direct power of the sun during the summer months, therefore it is essential that some method of shading is devised. At the same time it should be remembered that all orchids require as much light as can be given to them and thrive accordingly, but if shading is neglected the leaves will turn a sickly yellow, and drop off. Growth will be considerably checked and young tender growths on the plants will also be affected, especially in the early spring after the long period of dull and short winter days, when the sun is rapidly gaining in power and the days are getting longer, at which time orchids are more liable to be damaged easily. Shading of whatever kind must be in use by the end of February, especially where the house gets the early morning sun.

Lath Blinds

The best form of shading is permanent lath blinds, which are made to lie upon the roof of the greenhouse. Such blinds can be made in convenient-sized panels, which may be easily taken down or put up at will, according to the immediate weather conditions. Strips of wood such as ceiling laths, the length of the roof, may be joined together, with cross pieces, leaving about ⅜ inch gap between each strip, thus allowing the sun's rays to pass over the plants. This amount of sunlight is not sufficient to harm the foliage. When such lath panels are not in use, they can be hung on to the sides of the greenhouse.



Side elevation of greenhouse showing method of shading with laths

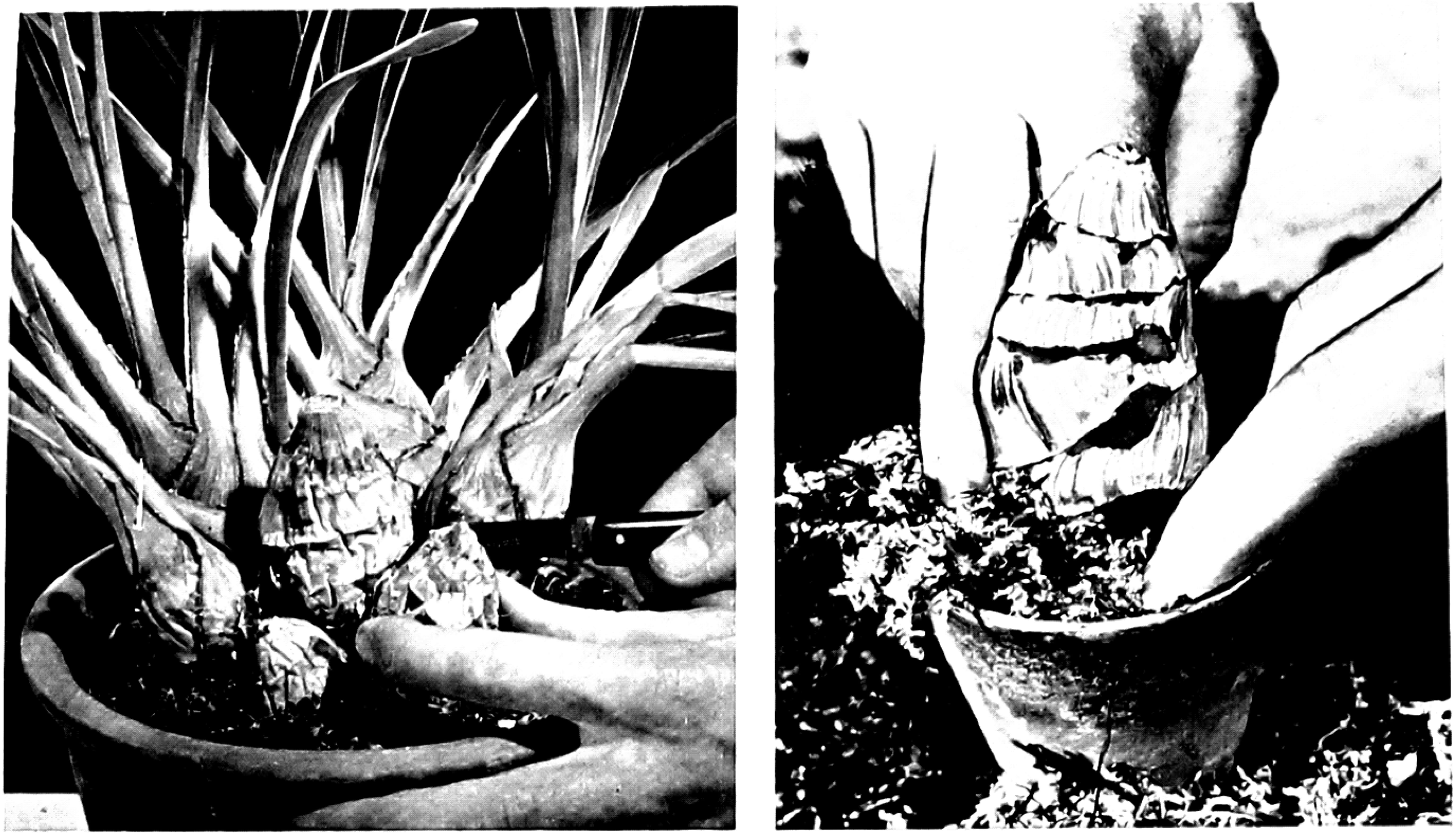
In the larger type of greenhouse the blinds can be made to roll up instead of being made in panels. For this purpose the laths are joined together with strong cord. Whichever type is decided upon it is advisable to erect upon the roof of the greenhouse a support for the blinds, leaving an air space of 10 or 12 inches above the roof when the blinds are in position. This air space has the effect of keeping the temperature in the house even and prevents the temperature from rising too high, an advantage where cool growing orchids are concerned. The blinds are also an additional protection during cold winter nights and can be used for this purpose.

Sometimes a grower may find it more expedient to erect a similar form of shading inside the greenhouse. This is easily done by making panels on the same principle as above, each panel being made so that it can easily be placed in position between each glazing bar and removed when not required. Alternatively, thin canvas blinds can be fixed inside the house, which may be pulled up or down as necessary.

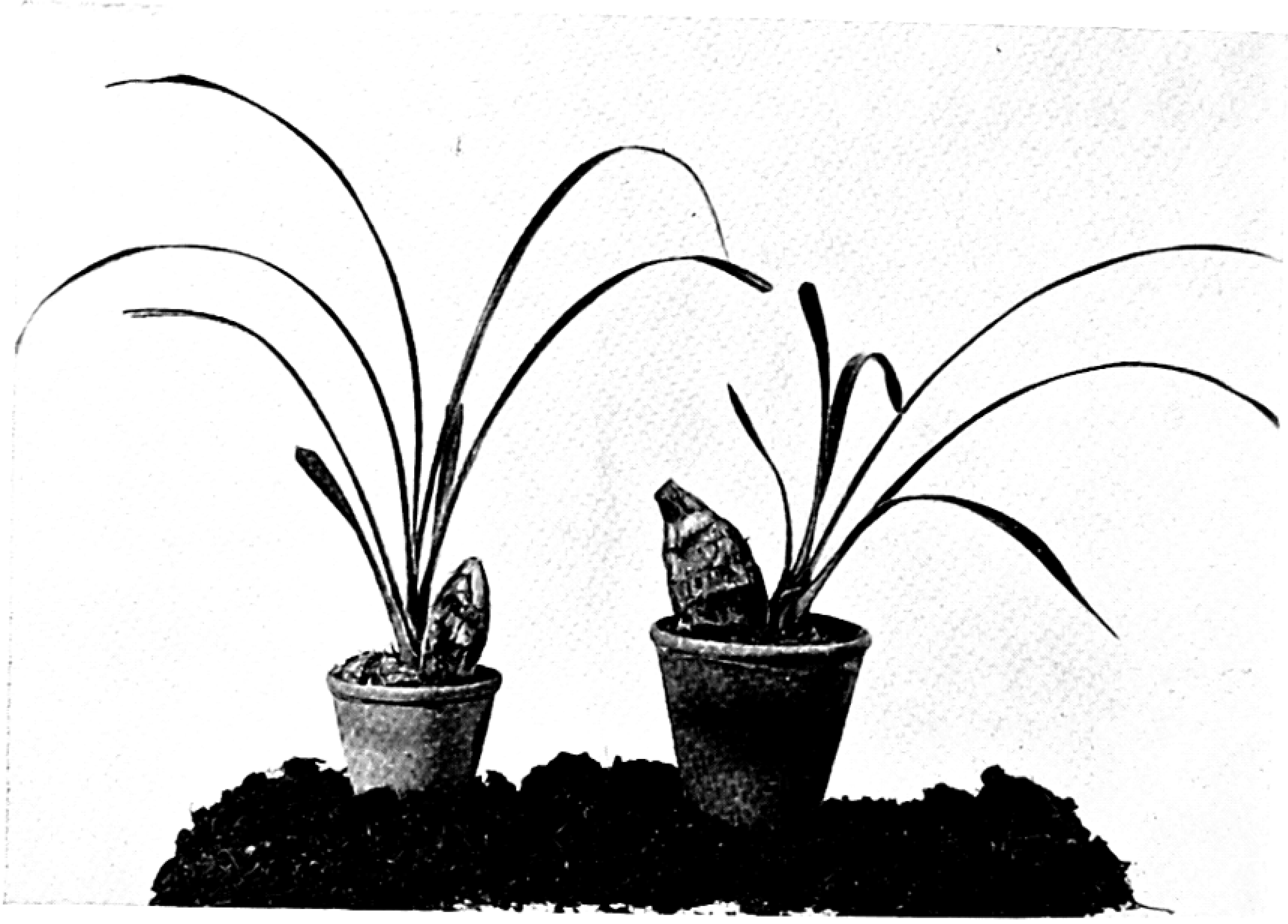
Shading with paint

Other forms of shading can be used but those described above are the most efficient. Where blinds are not used, other preparations can be applied, such as whitewash, permanent shading, etc. A good shading can be made by liberally thinning down white undercoating paint with paraffin and painting this on to the outside of the glass in strips, using a 1½-inch brush and leaving a narrow, ¼-inch space between each strip of paint. Provided the paint is thinned down sufficiently it can be wiped off quite easily at the end of the season, about the end of September, when the sun power will be on the wane. Stippling may also be resorted to, instead of painting in strips, but such forms of shading do not shield the house from the heat, they only break the direct rays of the sun. Stippling or completely painting over the glass should be carried out at the ends of the house as well.

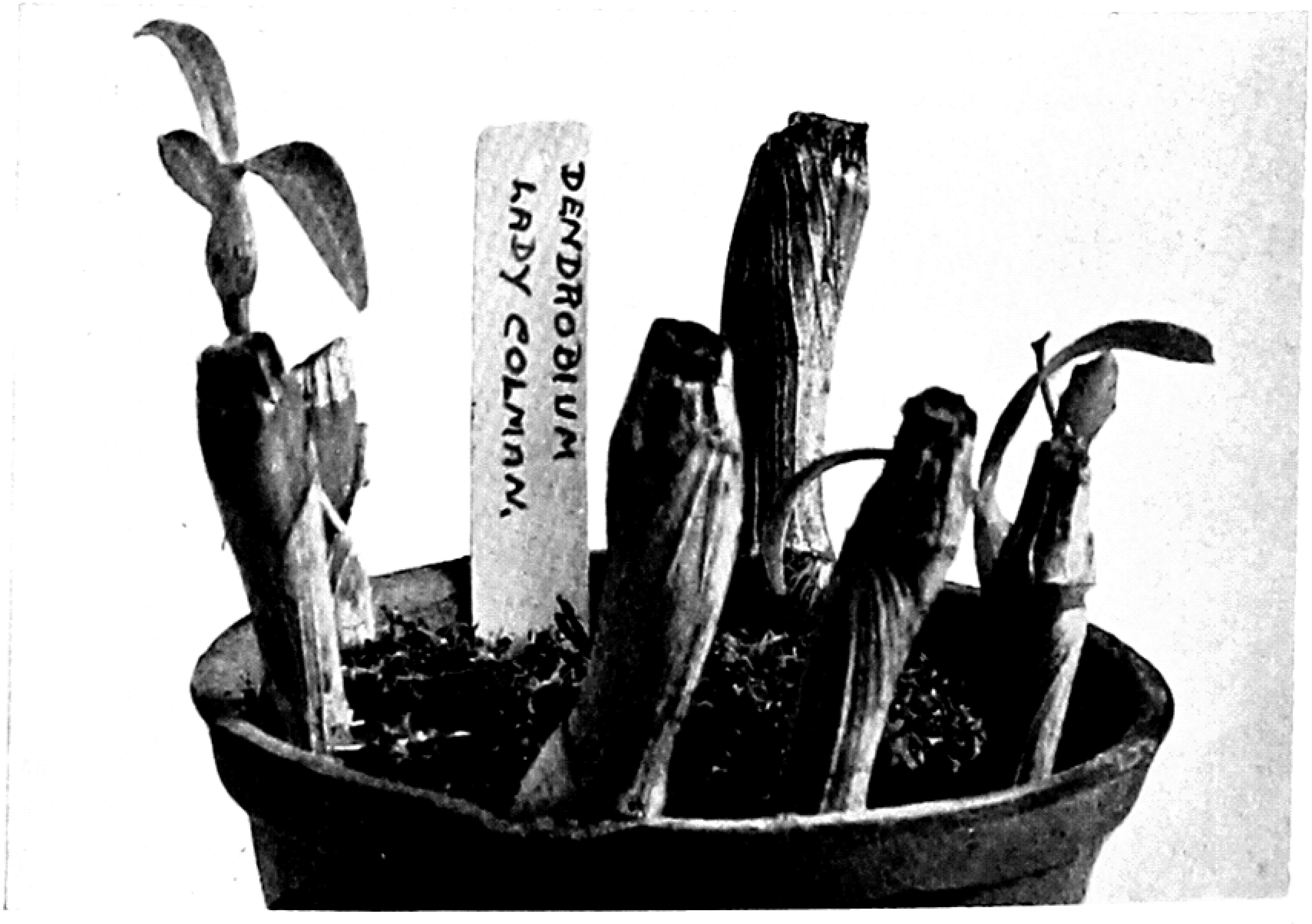
During the winter months orchids require all the light possible and, when the shading is removed in the autumn, see that the glass is well cleaned outside and inside the house.



Left: Back bulbs should only be removed from established plants. That in front has decayed; the two behind it may be removed for potting. Right: Potting up a single back bulb in a compost mainly consisting of sphagnum moss. Do not pot too deeply



Cymbidium back bulbs growing strongly, each making a new bulb. Old bulbs should not be removed



Sections of Dendrobium bulbs producing new growths, which are later taken off and potted up

CHAPTER THREE

Routine Culture

POTTING

WE NOW come to the question of repotting an orchid, which is much more easily done than explained, but first let us consider when an orchid requires repotting and the proper time to do it.

When to repot

Orchids may be repotted at any time directly after their flowering season, just before the plant is pushing out new roots. The exceptions to this are plants that flower during the autumn, the repotting of which is better delayed until the spring, for little root action takes place during the winter months. If repotted in the spring the newly made roots will be able to penetrate into the new compost, and they will have the benefit of the summer months, with good growing conditions immediately ahead of them. If, however, a plant has become waterlogged at the roots through continual overwatering and the compost has become sour, it should be thoroughly cleaned and repotted without delay.

Cattleyas and their allies usually have two periods of rooting, the first at the beginning of the season when new growth is being made and the other later in the year, when the growth made earlier on is reaching maturity. Therefore signs of new roots should be looked for, preferably when the new growth is being made at the beginning of the season. As soon as these are observed and, if possible, before the new roots actually appear, the orchid should be repotted. Damage to the young tender roots is thus prevented and the new roots will be able to enter directly into the compost. Provided the compost is in good heart Cattleyas will, of course, not require any repotting until the leading growths of the plant have grown over the rim of the pot. This also applies to other orchids that grow forward, which should with normal culture only require repotting when the plant has grown too large for the pot.

Suitable pots

With the exception of a few orchids it has been found over a period of years that the ordinary flower pot is the most satisfactory receptacle in which orchids will thrive. There are some that may be grown to advantage in teakwood rafts and hung from the rafters, for example *Cattleya citrina* and others mostly of botanical interest.

In selecting a suitable pot for the plant, never use one that is too large; use only pots into which the orchid will just fit, always leaving, of course, sufficient room for the plant to grow and with Cymbidiums, Cattleyas, Odontoglossums and others that grow forward, sufficient space must be left in tront of the plant to allow for this forward growth. Once an orchid has been repotted it should not be necessary, with correct culture, to repot it again ror at least two years or even longer, provided the compost remains in good condition and when repotting very often the same pot may be used again. A word of warning here may not be amiss. Never use glass pots, glazed or painted pots for they are most unsuitable for orchids since they are not porous like the ordinary clay flower pot. Large specimen Cymbidiums, however, grow well in teak tubs, and plants in full flower are a wonderful sight.

Composts

When only a few plants are to be repotted at a time, it will be found more convenient to purchase the compost ready prepared from any orchid nursery, stating for which type or types of plants it is required, as this varies according to the kind of plant to be repotted. When, however, a larger number of orchids have to be repotted, it may be found cheaper and more expedient for the grower to prepare his own compost; in fact, many amateurs with their own collections prefer to do this, having their own pet methods and mixtures of composts. Where it is desired to make up one's own composts, the following are suitable and will be found to be satisfactory for the particular orchids mentioned:

Compost No. 1 consists of:

3 parts of good fibrous loam
1 part of sphagnum moss
2 parts of osmunda fibre
1 part of old, partly decayed oak or beech leaves

The constituents are well and evenly mixed together, and to the mixture is added a quantity of crushed brick rubble or very coarse sharp sand to keep the compost open, and a very small addition of hoof and horn meal. The osmunda fibre must first be cut and pulled into convenient lengths, the loam broken up into small pieces, about the size of a small walnut, and only the best of the sphagnum moss used, discarding the brownish ends. This compost will be suitable for Cypripediums, Cymbidiums, Calanthes, etc. (for Calanthes use dry cow manure).

Compost No. 2 consists of:
2 parts of osmunda fibre
1 part of sphagnum moss

The osmunda fibre must be prepared as for No. 1 compost, and the sphagnum moss must be cleaned, all dead and foreign matter, bits of stick, etc., being removed, the oak or beech leaves should be rubbed small and only the flaky material included in the compost. This type is suitable for Dendrobiums, Cattleyas, Odontoglossums, Oncidiums, etc.

Compost No. 3 consists of:
Equal parts of osmunda fibre and sphagnum moss, well mixed together and prepared as above, to which may be added crushed brick, rubble or coarse sand.
Suitable for Vandas and similar orchids.

Osmunda fibre is obtained from the roots of osmunda fern. The best is imported, mostly from Japan in great quantities, cheaper types being imported from Italy and other European countries. During the second world war it was impossible to obtain and strenuous efforts were made to find a suitable substitute in our own country, but with little success. Welsh fibre was tried with mixed results as it was too soft in texture. At that time I even experimented with a Cymbidium hybrid, growing this orchid successfully in old shredded oak leaves, with a liberal addition of crushed brick rubble, the whole firmly packed into the pot.

Sphagnum moss is also essential in the culture of orchids, as it is acid and contains a certain amount of iodine which tends to keep the compost fresh.

The potting bench

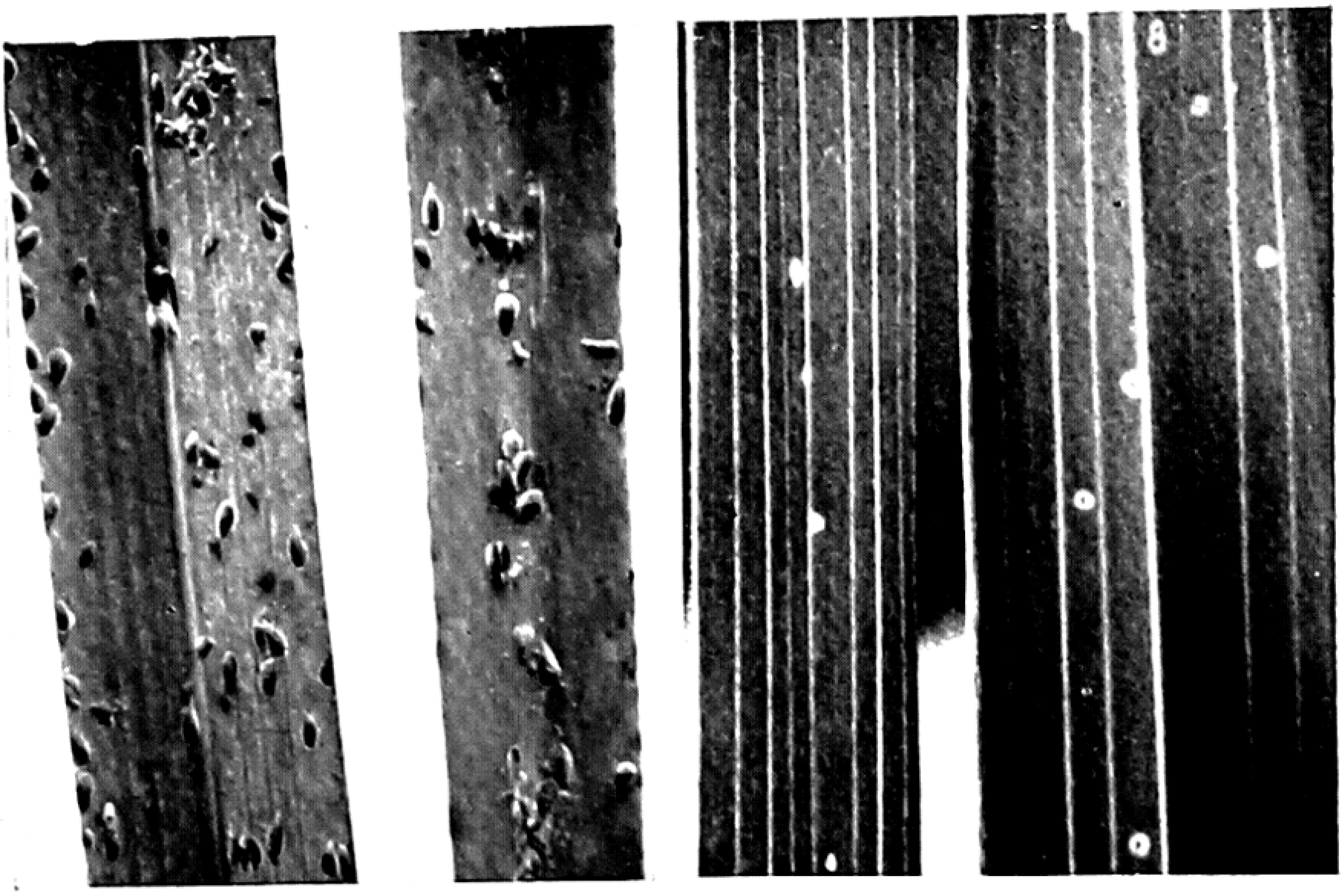
In the average amateur's collection, the repotting of orchids is usually done in the same greenhouse, no separate potting shed being available. This is, in fact, the best way of undertaking the repotting, as the plant is kept in the same temperature and atmosphere. Where, however, space is limited for the job, a suitable board, about 3 feet in length and of a suitable width can be placed across the end of the pathway, resting each end on to the staging. This may be removed after the work of repotting is completed. Alternatively, such a board may be fixed on to the door in the form of a flap, which can be let down or left hanging on the doorway. The only objection to this is that one must remember to have all one's potting materials handy inside the house, for it is most inconvenient to find suddenly when halfway through the operation that something has been forgotten that should have been brought in.

Repotting

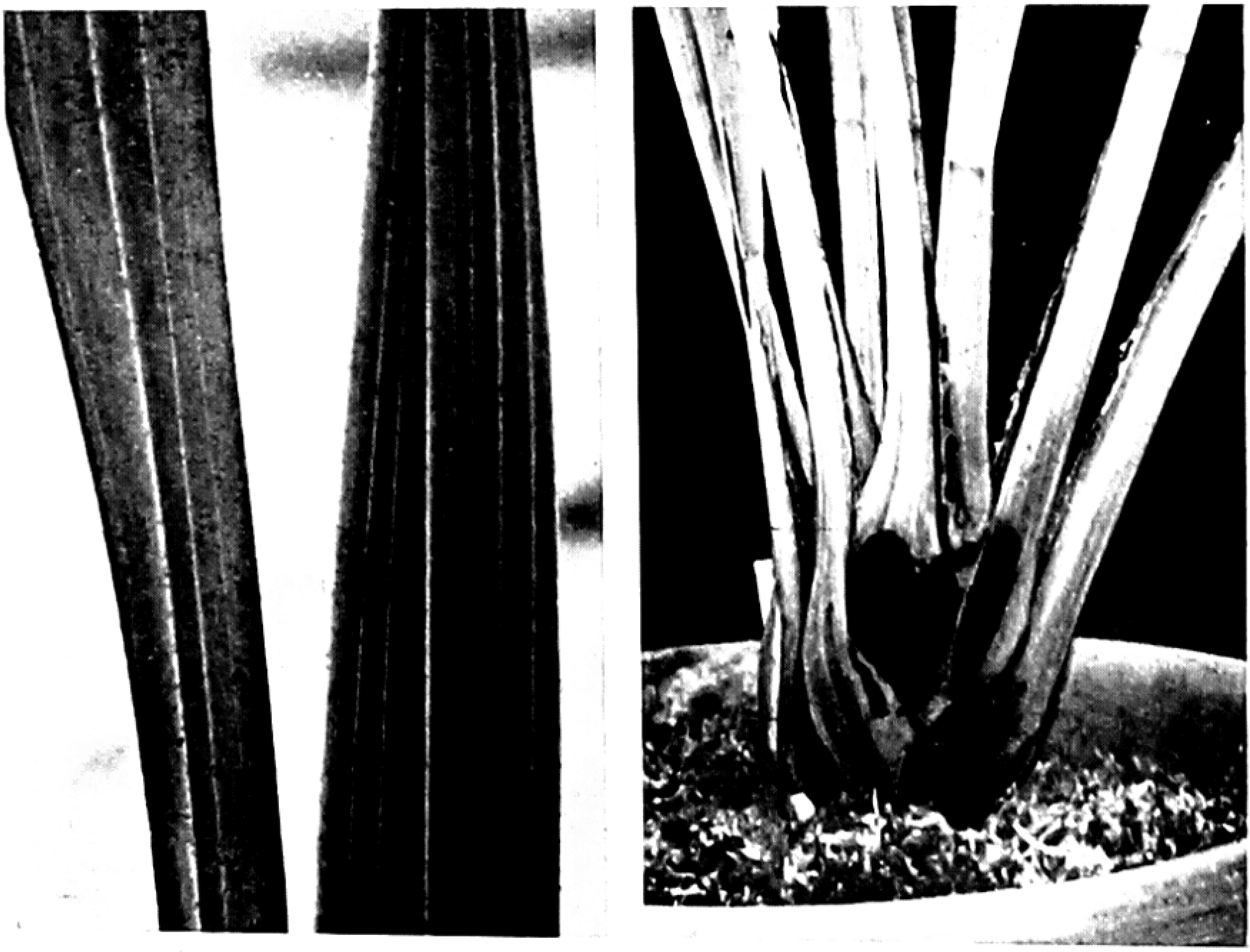
The particular plants to be repotted should have been allowed to dry out, for orchids must not be repotted in a wet state otherwise loss of roots will occur. Then, having got the board into position, and with all materials ready at hand, clean pots, clean crocks, compost in a semi-moist condition, scissors, potting stick, etc., preparations to proceed with the repotting may now be made.

First knock out the plant from its pot and observe the quantity of crocks in the pot, also see that the roots of the plant are in a dry state. Then carefully remove any crocks adhering to the roots and remove any old worn-out bulbs from the back of the plant, putting them on one side for the time being. Now take away all the old compost from the back of the plant only, being careful not to disturb the roots more than necessary. At the same time cut away cleanly any old dead roots that may be present. This will leave the front half of the plant exactly as it was and it is not interfered with in any way. By the removal of the old bulbs, if any, and the rear portion of the old compost, it is often possible for the plant to be returned to the same pot. Put the plant back into the pot, holding the back of the plant to the side of the pot and judge whether there is sufficient room left at the front of the plant for another two or three new bulbs to grow. If this is so, then the same pot will do, if not, then take a larger size, remembering that it is a mistake to use a pot too large for the plant. Orchids resent this and in any case it is a waste of compost.

Presuming that the same pot is being used, place fresh clean crocks at the bottom of the pot, the same amount that was present when the plant was knocked out. These crocks should be put in in vertical layers to ensure swift and complete drainage. If the orchid is a Cymbidium, a compost similar to No. 1 described on page 36 may be used, and a small sprinkling of bonemeal may be sprinkled among the crocks (this applies only to Cymbidiums, and not to other orchids). On the crocks place a

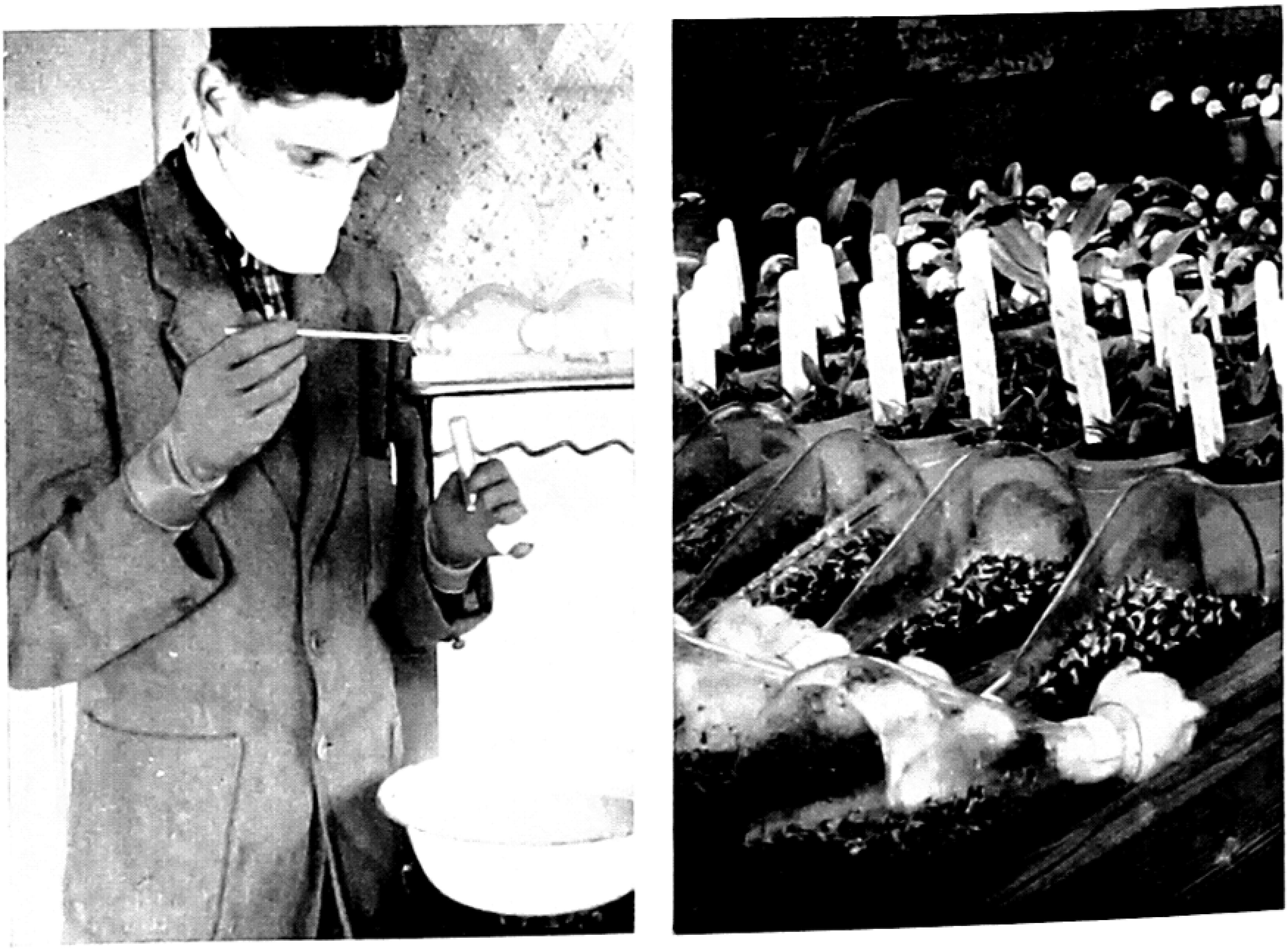


Left: The leaves of plants affected by scale insects
Right: The first sign of thrips is the appearance of tiny punctures in the leaves



Left: Red spider produces a silvery sheen on the underside of the leaves
Right: A Cymbidium pseudo-bulb eaten away by a slug

Left: Fumigating with D.D.T. or azobenzene smokes. Right: When spraying with insecticide particular attention should be paid to the undersides of the leaves



Flask culture of orchid seedlings. Left: Inserting the seeds into the flasks with a platinum wire loop over steaming water. Right: Seedlings growing in the flasks layer of sphagnum moss, old oak leaves or old beech leaves, to stop any of the compost from getting down among the crocks and perhaps preventing free drainage. Next take the prepared plant in the hand and insert underneath it a liberal quantity of fresh compost, place the plant in the pot, standing it firmly upon the oak leaves and judge whether the top surface of the compost will come to within ½ inch of the rim of the pot when the repotting is completed. If the plant stands too high remove a little of the compost accordingly, but if too low then add more compost underneath. Then hold the plant firmly in its correct position, that is with the back of the plant against the side of the pot, and proceed to pack in with compost the vacant spaces in the front and sides of the plant until the pot is about ⅔ full. Use a potting stick to pack the compost in with and make sure that all is firm and no cavities are left. By this time the plant should be standing in position without any assistance and the final packing may be completed.

For the final surfacing up of the plant take a small portion of compost in each hand and place the hands together, then pull them apart and place them together again. This movement may be repeated, thus making vertical layers of compost and in this state it may be inserted in the pot, one portion at a time, working always towards the centre and using the potting stick to tuck it in with. Gradually work all round the plant until all the space is firmly filled. There should then be a considerable amount of compost showing above the rim of the pot and this is trimmed off neatly with a pair of scissors or small shears. When this is done the compost will be nearly level with the rim and the potting stick is brought into use again, working it round the outside edge of the compost, pressing it down firmly to about ½ inch below the rim of the pot, to allow for future watering. A final trimming off of the odd bits of compost sticking up will make all neat and tidy and any trimmings may be shaken off. The orchid should then be sitting firmly in the compost without any sign of looseness or wobbling about. Should this occur it must be made good by packing in a little more compost.

It is important to remember to replace the label with the name or species of the plant. Finally, if all is well, as it should be, it should be possible to lift the plant up gently by the foliage without the pot falling off.

The foregoing method of potting applies to all orchids that tend to grow forward, with the exception of Cattleyas and similar orchids, the only difference being in the compost used.

Cypripediums and other orchids that do not grow forward should always be repotted in the centre of the pots, as also should orchids that grow upwards with a single stem, for instance Vandas.

When the repotting is completed, the orchid must not be watered for several days, but should be kept well shaded for the time being, giving it a light overhead spray, to keep the foliage fresh, once or twice a day according to the weather. At the end of this time the plant may be given a good watering and normal culture continued.

Potting up the pseudo-bulbs

Reverting to the pseudo-bulb removed and put aside, with Cymbidiums, Odontoglossums and Lycastes, such back bulbs may be potted, not too deeply, in a softer grade compost or even pure sphagnum moss. Some growers use only wet sand. There is a good chance that such a back bulb will eventually make a new growth. It is, in fact, the only way to obtain an exact replica of a particular plant, other than by division.

RESTING

Except for young seedling orchid plants, which should be grown on steadily until reaching maturity, all orchids require a period of rest of varying length, some requiring only a short, moderate period with an occasional watering, while others need a definite rest for longer periods and are kept dry until new growths appear. Usually after the pseudo-bulb has quite matured, water is gradually withheld so that the bulb may become hardened during the winter months, only giving sufficient water when there are signs of the bulbs becoming shrivelled, or the foliage becoming limp and lifeless. Watering should not be necessary except at long intervals.

Cattleyas, Epidendrums, Lycastes, Dendrobiums, and the like, and all orchids that are in a dormant state when there is little or no root action, may be treated as above.

Other orchids, especially those that have no pseudo-bulbs, are never given a definite rest. Cypripediums, for example, should be kept just moist all through the winter as they are nearly always on the move. Odontoglossums, Oncidiums, Vandas, Aerides, Masdevallias and similar plants, are similarly treated, being given only just enough moisture to prevent them from getting dry, combined with a slightly lower temperature. Odontoglossums and Odontiodas will only require a short rest.

Dendrobiums will have completed their season's growth when the two terminal leaves at the end of the elongated bulb are matured. When

Odontoglossums, etc., that have made up their bulb are not making new growth, it is a sign that they may be given a rest. Cymbidiums after flowering will benefit from a short period of rest, as will any orchid after flowering, provided new growths are not being produced.

All orchids that are to be rested may be placed at the coolest end of the greenhouse, and given a little more light and air. There they may remain until signs of new growths appear and root action starts again. At this stage such plants may be replaced in their respective positions in the collection and normal treatment continued.

In general it may be observed that terrestrial orchids are kept moist all the year round, with less frequent watering during the winter, and are never allowed to dry out completely. Epiphytic orchids are allowed to dry out partially between each watering, with far less frequent watering during the winter, as the compost takes longer to dry out during the winter months than during the summer.

WATERING

The watering of orchids is really quite a simple matter when judgment is used, but the question of when and how to water these plants seems to perplex many people. One of the greatest mistakes which seems to be made when watering orchids is that of giving them treatment more fitted for bog plants, by overwatering them and keeping them in a perpetually semi-sodden condition. This is bound to lead to failure and disappointment, by the eventual stagnation of the compost and consequent loss of roots, since the compost has no opportunity of drying out between each watering. Thus it will be seen that the term 'overwatering' really means giving the plants applications of water far beyond their requirements and at too short intervals. It is this that causes the compost to deteriorate rapidly and decompose.

By allowing the compost to dry out between each watering, it remains in a fresh and sweet condition for a much greater length of time. Where correct watering is practised and the compost maintained in a wholesome condition, it may be two years or more before repotting the plant and replacement of the compost becomes necessary.

Overwatering has no doubt been one of the main causes why many who have attempted to grow orchids have given up in despair.

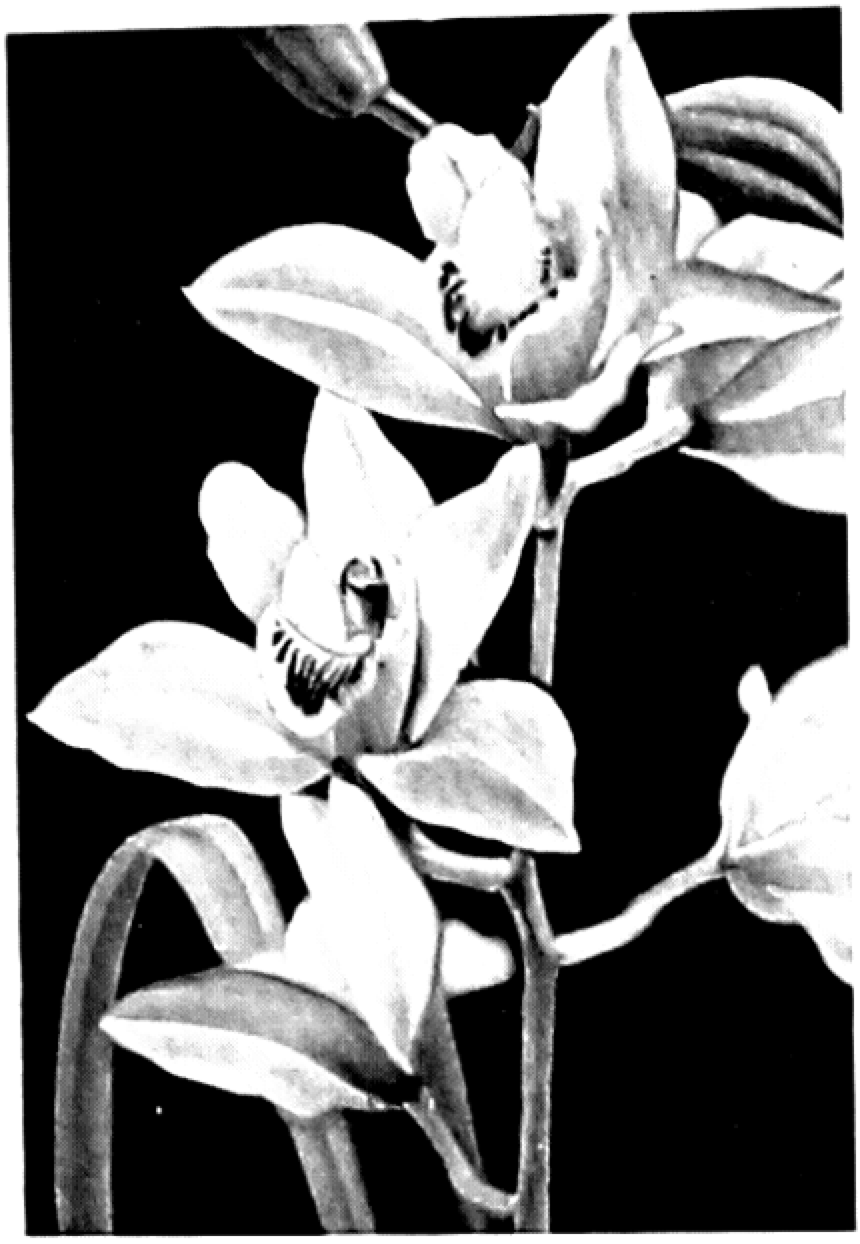
For the watering of orchids a watering can with a long spout will be found to be the most useful, especially for reaching in between the plants to those at the back of the staging. It is, however, a great mistake to make daily tours of the greenhouse, giving each plant a dribble of water here and a dribble of water there. On the other hand it is no good whatever neglecting the watering of a plant by going to the other extreme and letting it stand on the staging week after week without any attention or watering of any kind. This again is only courting disaster, for it leads to shrivelling of the bulbs and drying up of the leaves. Once an orchid has been allowed to get into such a state of neglect, a long period of convalescence must follow before the plant can be brought back to health, therefore one must remember that the use of the watering can requires consideration, bearing in mind the requirements of the plant receiving attention.

The following are the usual requirements in the watering of orchids and may be taken as a general guide. To find out whether an orchid requires water the pot may be lifted and if it lifts lightly water may be given, but should the pot and plant lift heavily, no water will be required. Other indications that an orchid requires watering are when the surface sphagnum moss is dry and a greyish colour or when the surface compost feels crisp to the touch. Should the grower be doubtful whether to water or not, then to be on the safe side defer watering for another day or two, or even longer, especially during the winter, when compost takes longer to dry out than during the summer.

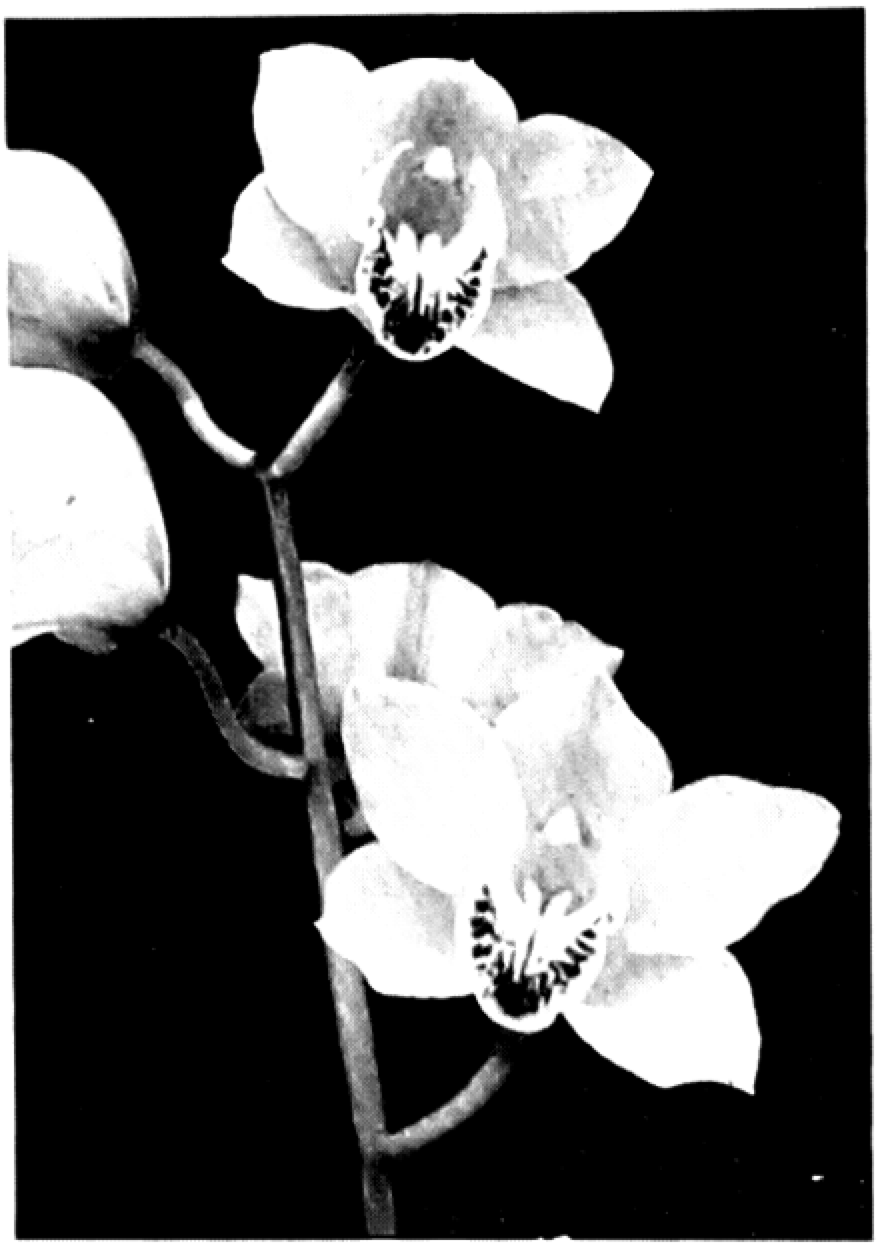
When a plant is really in need of water, then give it a thoroughly good watering, making sure that the whole of the compost is well wetted throughout. The plant should be watered carefully from the edge of the pot, taking care not to splash water all over the plant as this will lead to more trouble. Alternatively the pot can be steeped in a bucket of water nearly up to the rim. This is a particularly suitable method for those orchids which hang in baskets or pots from the roof of the house.

In all greenhouses provision should be made for the collection of soft rain-water into a tank inside the greenhouse from the outside guttering. Water which may contain lime and other chemicals is usually hard water, and should not be used for the watering of orchids. The rain-water tank should be kept covered, to keep the water clean, except when the rain-water is being taken from it. A wooden lid which may easily be removed or lifted is most convenient for this. It is advisable to have the tank as large as space will allow.

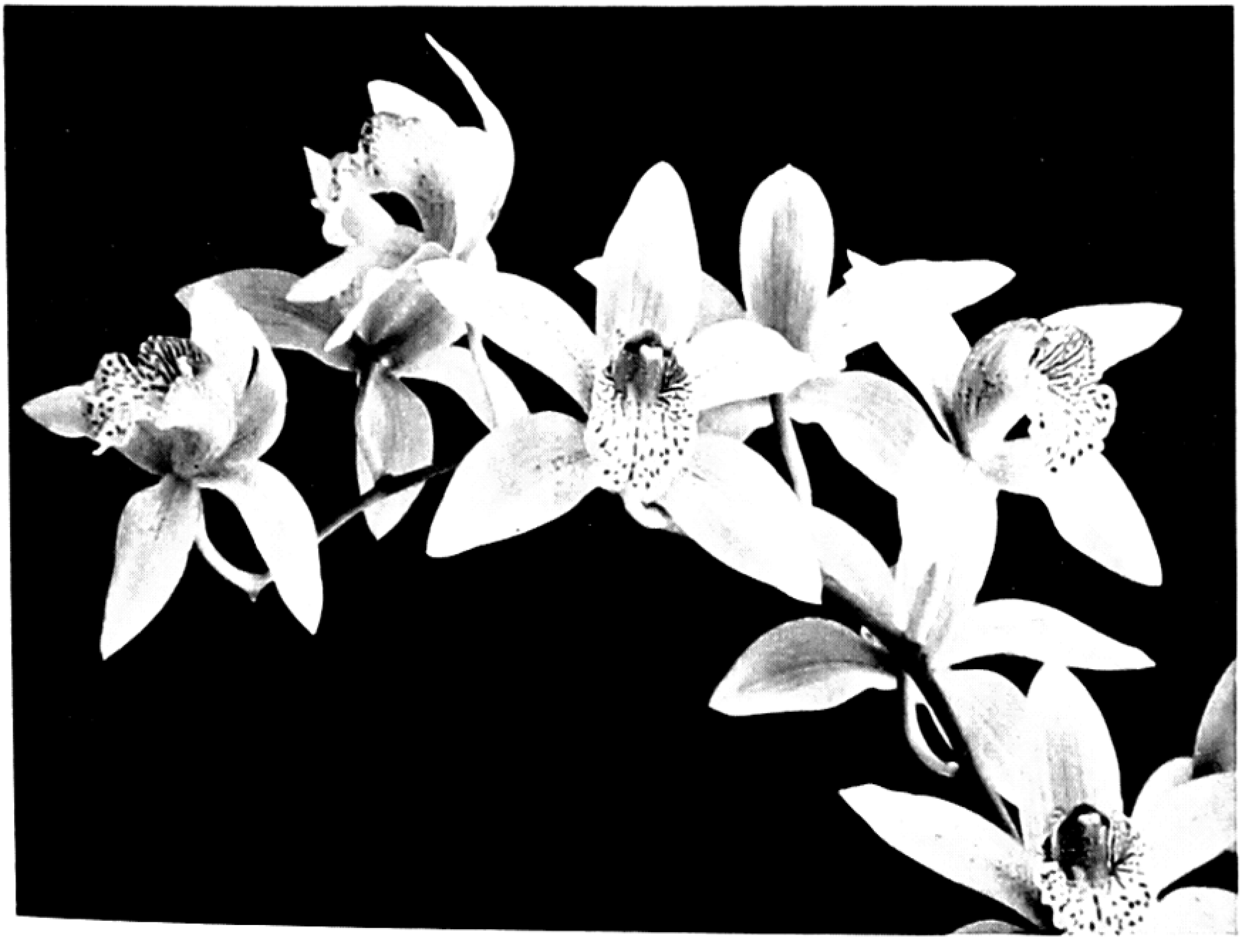
In watering orchids it will readily be observed that the compost in the smaller pots dries out quicker than the compost in the larger pots, consequently the smaller pots will require to be tested more frequently and watered accordingly. In general, less watering will be required during the winter than in the summer, for the same reason. Newly-potted



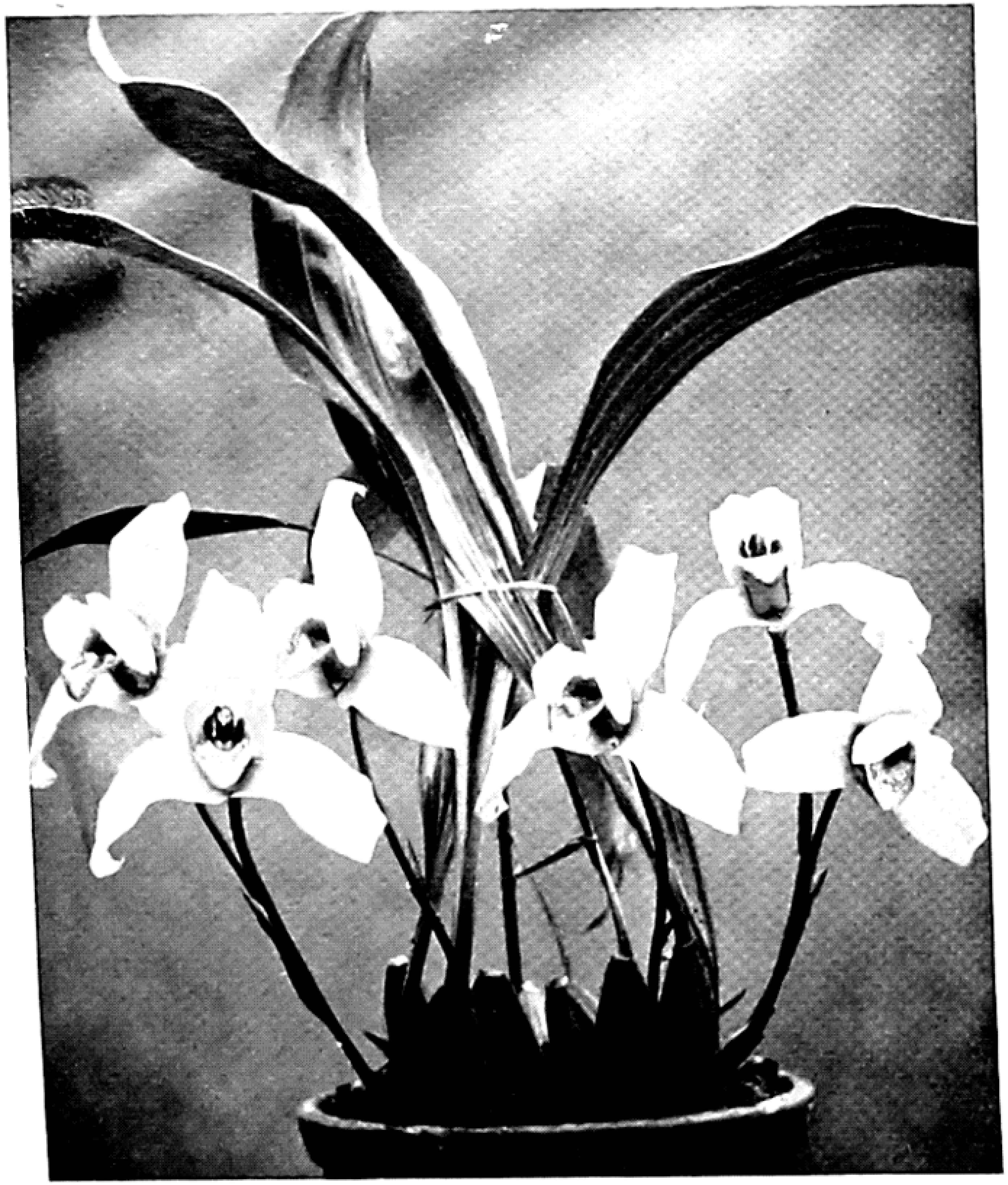
Cymbidium 'Seaborne'

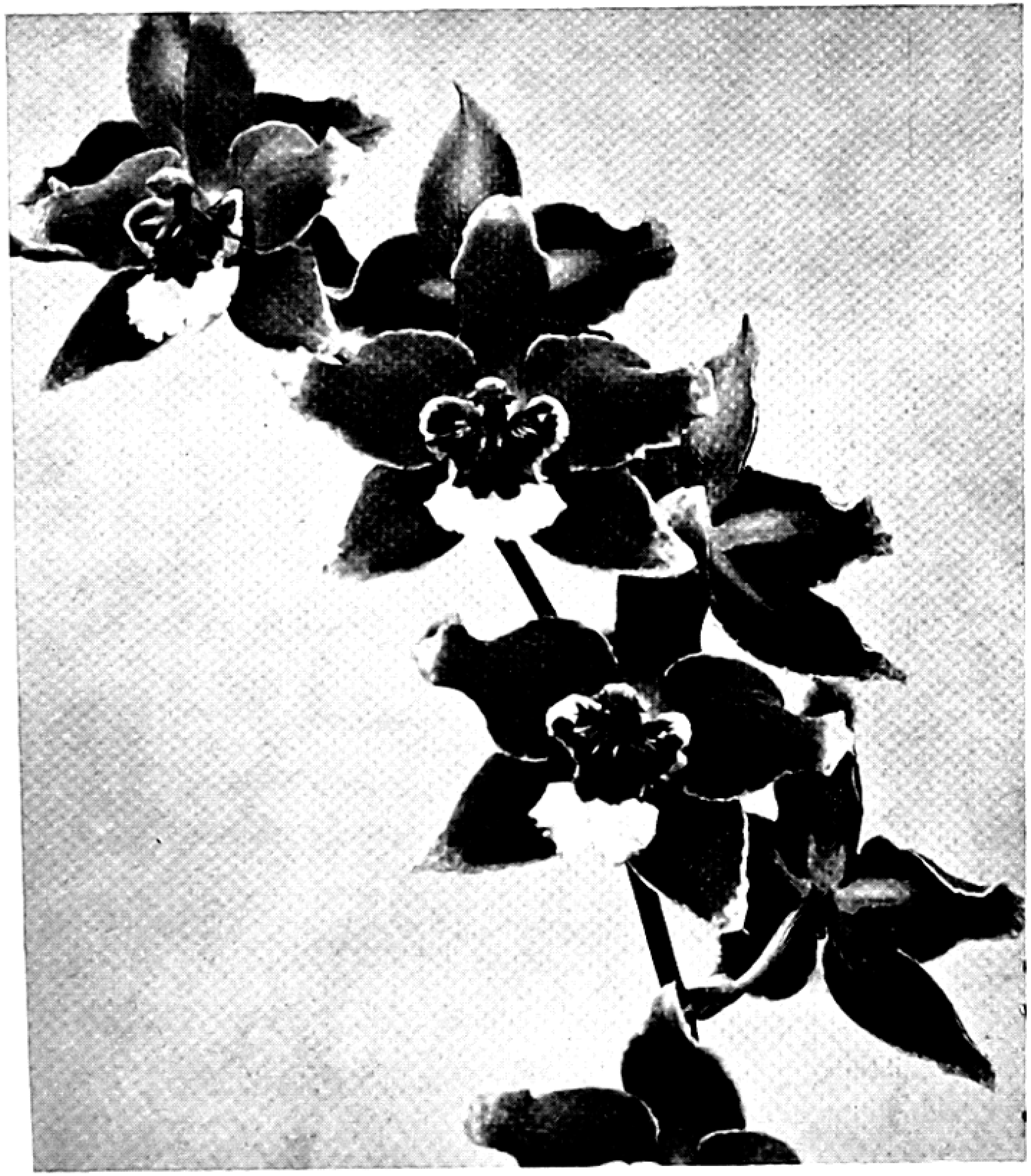


Cymbidium 'York'



Cymbidium 'Stourbridge'





Left: Lycaste skinneri *Right: A typical Odontioda, a hybrid between* Cochlioda *and* Odontoglossum orchids will require careful consideration and should not be watered at all for several days after repotting, when they may be given a thorough watering and then not watered again until they are partially dried out. This treatment will encourage the roots to become established in the new compost.

The water should be as near as possible to the temperature of the atmosphere of the house to prevent the roots from being chilled; hence the importance of having the rain-water tank inside the greenhouse.

In addition to direct watering of the roots, all orchids benefit from a light spraying overhead once or twice a day during hot summer days, paying special attention to the underside of the leaves. This treatment refreshes the foliage and acts as a deterrent to red spider and thrips and assists in creating a good growing atmosphere. Where any orchid is in flower, care must be taken that the water from the spray is not allowed to get on to any of the blooms, since they are liable to become spotted when water lodges upon them. On days when the weather is not too warm a light overhead spray may be given during the earlier part of the day, making sure that no water is present on the leaves overnight.

Get to 'know' your plants and with care you are not likely to go far wrong in the matter of watering.

FEEDING ORCHIDS

Anyone who is growing orchids will have given considerable thought to the question of whether or not they require any manure, and there is no doubt that there are great differences of opinion on this subject. Let us first consider the method by which an orchid, in its natural state, gets its nourishment.

Orchids fall naturally into two classes, Epiphytic and Terrestrial orchids. Epiphytic orchids, in their struggle for existence and light, generally grow naturally up on the trees, subsisting mainly on the humus and debris collected in the forks of the branches of the trees. Their root systems serve the dual purpose of absorbing nourishment from such debris and at the same time obtaining a firm anchorage for the plant. Thus it will be seen that, in nature, there is very little manure directly available, from which the roots may absorb nourishment. Such plants do obtain water and possibly a little nutriment from the air laden with moisture and dissolved gases, arising usually as early morning mists from the forest floor. Under cultivation in a glasshouse, it is often advocated that such conditions should be imitated as nearly as possible, by applying manure atmospherically, for epiphytic orchids absorb as much nourishment through the undersides of their leaves as with their roots. Soot water may occasionally be watered on the paths with a watering can and a little lime may be used, but where a grower lives near smoky towns, there will be no need for this practice as the air is already charged with soot. A very weak solution of cow or horse manure may sometimes be sprinkled on the pathway, preferably in the evening, to assist in maintaining the foliage a darker green by the slight fumes given off.

Terrestrial orchids are found mainly as occupants of the forest floor, where the conditions are shady, while others, of course, grow on prairies. The root systems are usually more fleshy, as with the Cymbidium, which makes considerable roots. The green-leaved Cypripediums and Cymbidiums may have a sprinkling of hoof and horn meal incorporated in the compost when being repotted and also a sprinkling of coarse bonemeal among the crocks in the bottom of the pot, at the same time. Other than this no orchid requires feeding, except, perhaps, when the two mentioned above are in advanced bud or flower spike, when a very weak solution of manure water may be given. This is prepared by soaking a quantity of ½-inch bones in water and greatly diluting the solution with soft rain-water. Some growers prefer to use a weak liquid solution of cow manure for the same purpose and it must be admitted that good results have sometimes been obtained while at other times no difference appears to have been made. For those who do feed their plants in this way it is better to continue once they have become used to it otherwise they may deteriorate when the practice is discontinued. In any case no direct or indirect manuring or feeding should be done during the winter months.

On the whole it is, perhaps, far better not to begin direct feeding of any kind, but rather to grow the plants hard with ultimately just as satisfactory results. Over-feeding by direct application is likely to undermine the constitution of an orchid in time, when virus, indicated by yellowish streaks in the leaves, will probably make its appearance.

IMPORTED ORCHIDS

At one time, before the hybridist got busy, orchid species were imported in thousands from all parts of the world and sold by auction in the London sale rooms. Many are the romantic stories of travel, adventure and tragedy attached to these plants and the fabulous prices realized for any outstanding or newly-discovered orchid. Those days of wild scramble are now over and orchid species have been for the most part ousted by the hybrids of all kinds which have so greatly surpassed the species in their extreme beauty, texture, shape and solidity of their flowers. Today, orchid species from which fine hybrids have been evolved form only a small part of orchid culture.

For the amateur with limited glass at his disposal, species need not play any important part in the collection. Space is valuable and it is far better to utilize it for an orchid of merit, such as one of the modern Odontoglossum, Cymbidium or Cattleya hybrids produced by the fine orchid nurseries in our own country. The running costs of a greenhouse are exactly the same when it is filled with a nondescript collection of species, with few exceptions of doubtful value, as they are when it houses a fine collection of worthwhile orchid hybrids of which there is an unlimited choice, giving endless satisfaction.

Nevertheless, there are many species that are still well worth growing. These may include orchids such as Vandas, Dendrobiums, a few Odontoglossum species, especially the old favourite *Odontoglossum grande, Lycaste skinneri: Cymbidium: lowianum* and perhpas *Cymbidium traceyanum*, Cattleya species and Laelias. Species may also be purchased, partially established in pots, from many orchid nurseries in this country and it is perhaps better for the amateur to do this rather than to import them.

Sometimes friends abroad send plants and when these have had a long sea journey, they invariably arrive in a shrivelled condition, from which they do not always recover. It must be admitted, however, that it is a source of great satisfaction to succeed in bringing such plants back to normal health and strength.

All imported orchids that have arrived in a shrivelled condition should be carefully inspected upon arrival and cleaned by cutting away any dead leaves, old dead roots and any decayed parts. The plants should be examined carefully for signs of any insect pests, especially scale, and should be carefully washed with a nicotine insecticide, and afterwards hung upside down in a warm, moist and shaded position in the greenhouse. The new arrivals should be given an occasional spray with water until the foliage shows signs of plumping up, after which, when further signs of growth are seen, either by new growth showing or the appearance of new roots, the plants should be potted up and kept well shaded, and very carefully watered for some time until they have become thoroughly established. They may then be placed in their allotted positions in the collection.

When orchids have been imported by air, they are invariably in a much sounder condition and consequently it is easier to get them established. Plants that arrive in good condition may be potted up straight away, but instead of using compost, they should be potted in a suitably sized pot, filled with small broken crocks only and held in position with a stick. Without overdoing it the crocks should be kept in a moist condition and a light spray overhead will be beneficial. On no account, however, must water be allowed to lodge on the plants or in the axils of the leaves or decay may set in and the plant will die. The newly-arrived plants must be kept under observation, and as soon as it is seen that they are progressing favourably, by showing movement in growth or the formation of new roots, they should be potted up in the appropriate compost and kept well shaded against strong light, with not too frequent watering. Later they may be added to the collection and normal cultural treatment provided.

TAKING STOCK

It is necessary for orchids, like any other greenhouse occupants, to be given an overhaul and the stock checked up from time to time. For this purpose the dull, quiet late winter months seem to be a good time of the year, for then there is little else of importance for immediate attention.

Begin with a general clean-up of the house itself, washing down the paintwork with soap and water and cleaning the glass both inside and outside. This is especially necessary near towns, where the atmosphere is more smoky than in country districts. Where the house has brick or breeze walls these should be lime washed. The hot-water pipes may also be given an application of a mixture of vegetable black and linseed oil to improve their appearance and stagings that are covered with shingle or other moisture-holding material should be well washed or replaced entirely if in a very dirty state. Where the stagings have no coverings it is simpler to scrub them with soap and warm water, removing any green scum that has accumulated. The rain-water tank will probably need attention and if the sides are dirty, the tank should be emptied and the sides well scrubbed until thoroughly clean.

In general the whole house should be given a good 'spring clean' from end to end. It is this cleanliness that is so important to the welfare of the plants and the keeping down of injurious insect pests. Should the interior paintwork be in a bad condition after being washed, all parts that should be painted may be given a coat of good lead undercoating paint, followed by a coat of good finishing paint and at the same time any minor repairs to the woodwork may be attended to. Where it is noticed that a glazing bar has become partially rotted the affected part should be cut clean away and replaced with sound timber. It is sometimes advisable to remove the whole of the glazing bar, when it will be found necessary to postpone the operation until a favourable spell of fine weather, but the rest of the cleansing and painting of the interior may be proceeded with. After repainting all the necessary parts a little ventilation should be given to let the smell of the paint escape; no harm should come to the plants.

Having got the house thoroughly clean and in a good state of repair, all the pots containing plants should be given a thorough cleaning by scrubbing them with soap and warm water until all dirt and scummy surfacing is removed.

The plants themselves may then be attended to. Handle each plant individually and examine it thoroughly. If the surface of the compost has deteriorated and become scummy, but the plant does not require repotting, then it is a simple matter to remove and replace the top layer of compost with fresh material. Where the sphagnum moss has overgrown almost to the point of smothering the pseudo-bulbs, it should be trimmed back with a pair of scissors. Fern spores are often introduced with the sphagnum moss and where young ferns have appeared in the pots, although they may look pretty, they must be pinched out with finger and thumb, or picked out with the point of a penknife for they are detrimental to orchids. The foliage of the plant may also require attention. Where the ends of the leaves have turned brown, they should be trimmed back to the healthy, green portion and any yellowing leaves from the rear of the plant should be removed altogether. Finally examine the plant carefully for any insect pests lurking in the crevices and axils of the leaves where they are attached to the pseudo-bulbs, or with Cypripediums and others that have no pseudo-bulbs the undersides of the leaves and bases of the growths should be examined for scale insects. Should insects be present the remedy must be applied as recommended in Chapter Five. Finally the foliage should be sponged down with a weak solution of insecticide and wiped off again with clean soft water. When the grower is satisfied that the plant is clean and tidy it may be given a new label with the name neatly written upon it and replaced in its former position. It is surprising the great sense of satisfaction one experiences when the work has been done properly.

Where a collection of orchids has gradually increased in number over a period, it is very useful to keep a register or stock book of one's acquisitions. This should record the date of purchase, the progress made since purchase, description of the flowers and other items of particular interest. Each plant can be given a number which should be written on to the plant label in the pot and recorded in the stock book. By keeping such records it is possible to see at a glance the extent of one's stock of plants and any omissions in the collection may be made good without fear of unnecessary duplication. A specimen stock sheet is shown below. The rulings for this can be varied for the Intermediate House.

GROWER'S NAME ....

ADDRESS ....

STOCK LIST OF ORCHIDS FOR THE COOL HOUSE

Ref No	*Name and description*	*Date*	*Where purchased*	*Price*	*Colour of flowers*	*Record of progress*	*Other notes*

CHAPTER FOUR

Propagation & Hybridization

MANY AMATEURS as soon as they are in possession of an orchid for the first time start thinking of propagating from it and in their enthusiasm, which can be readily understood, are quite prepared to chop the plant to pieces. Unfortunately this can have dire results, for orchids are not, as are some plants, rapid growers and before any attempt at propagation is made, other factors have to be taken into consideration. It is no use whatever attempting to propagate from a plant that is too small or too weak, neither is it worth while, except for the sake of experience, to propagate from an inferior type of plant. Furthermore, not all orchids lend themselves to propagation except by simple division of the plant.

Cymbidiums and Odontoglossums and other orchids producing back bulbs may be increased by the removal of certain of the back bulbs, only when the plants are large enough to withstand the removal of one or more of those which have discarded their leaves. After removal of these back bulbs the parent plant should still retain sufficient bulbs of its own to ensure that the established character of the plant is not affected. The operation is usually carried out when the plant is being repotted and has already been mentioned under 'repotting' on page 38. If three back bulbs are removed from a Cymbidium, they may each be potted up firmly and separately with an equal chance of producing young growths, which, incidentally, is a slow process. For potting up these back bulbs use a finer grade of compost, or insert them firmly in chopped sphagnum moss only. Whichever method is used the back bulbs should not be inserted too deeply. The new young growth will probably break from the base of the back bulb and if this is inserted too deeply, the new growth will probably rot away before it has had time to grow to the surface.

Having potted up the back bulbs, they should be placed in a propagating frame inside the greenhouse, thus ensuring a steady warmth with little fluctuation, and a moist atmosphere. These propagating frames need not be elaborate affairs and should be placed preferably at the warmest end of the greenhouse on the staging.

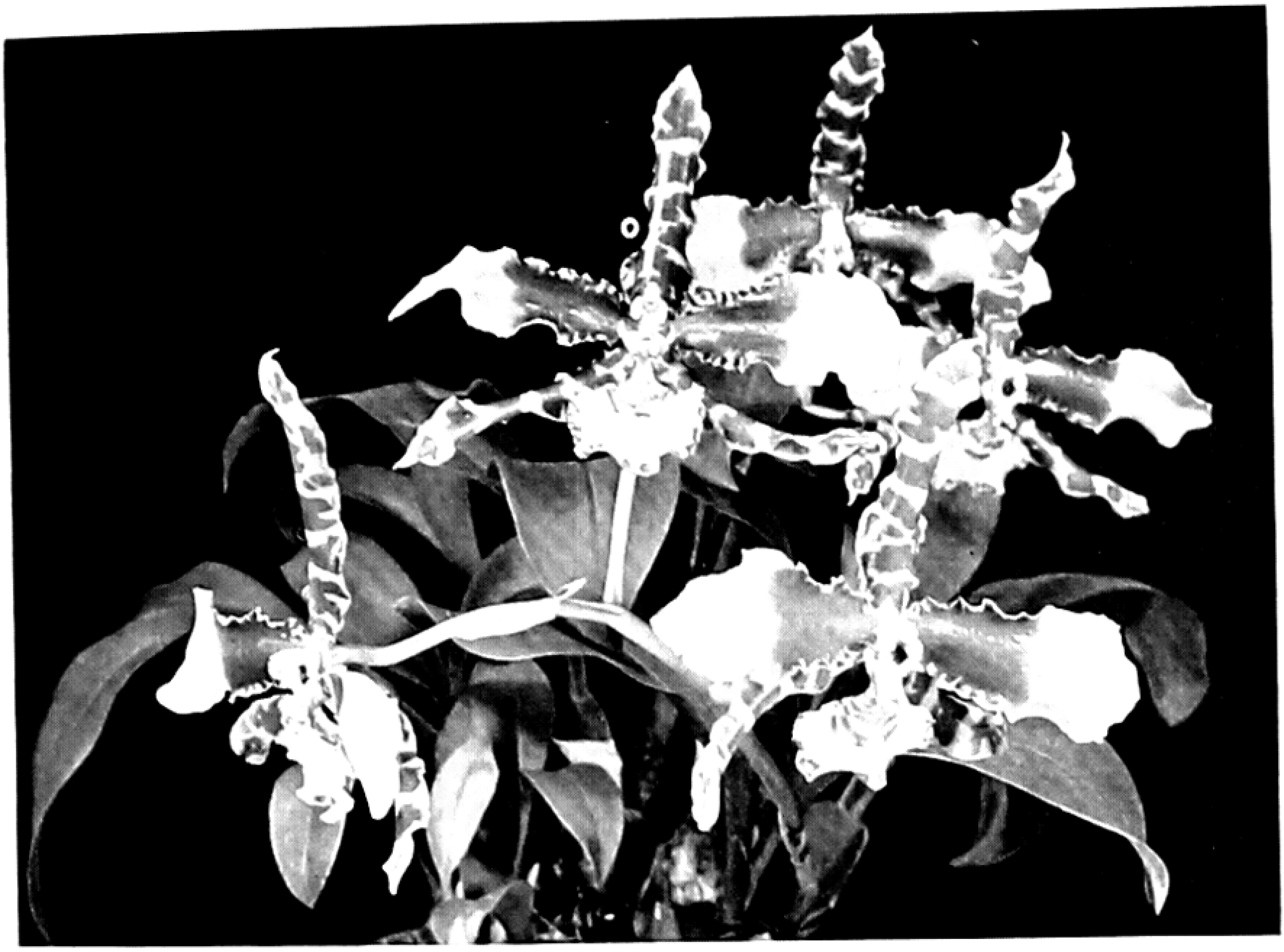
When at length young growths have appeared and are about 3 inches long, the pots may be taken out of the propagating frame and the plants grown on in the usual way, for by then the new growths should have begun to make roots of their own. Nevertheless, the original back bulb must be retained and not removed. This will in due course decay away naturally when it may be removed completely. At this stage the young independent plant may be potted into a suitable small pot with fresh compost and allowed to grow on being given similar treatment to that required for seedlings.

Dendrobiums can also be propagated quite easily. This may be achieved by removing a good healthy leafless back growth and cutting it into several lengths of about 2 inches each and inserting them round the edge of a 4- or 5-inch pot. This should be well drained and should contain a compost consisting of one part of clean sphagnum moss and one part of finer osmunda fibre, well mixed together and chopped fairly finely. The pots should be placed in the propagating frame where they will receive a steady warmth and genial atmosphere. In time, new young growths will appear and when sufficiently advanced these may be carefully taken off and potted up singly. Dendrobiums often produce young growths on the parent plants. These have their own tiny root system and as they are unwanted growths they should be severed cleanly (using an old safety razor blade to make a clean cut) and potted up into the smallest pots possible, using plenty of small crocks for drainage.

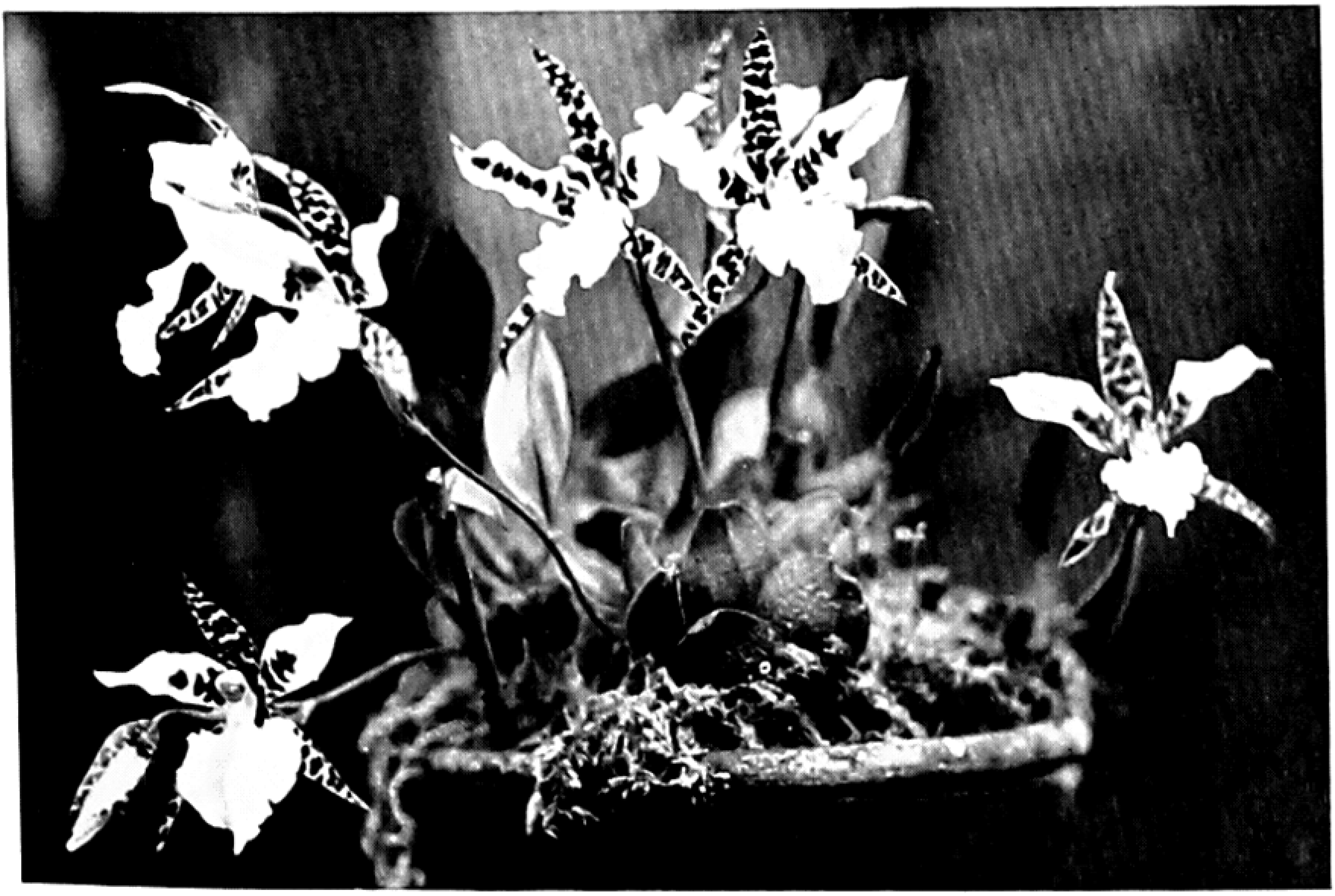
Epidendrums often produce young growths with roots on their stems. These may also be removed and treated in the same way as those of Dendrobiums.

Where Vandas and other stem-rooting orchids produce growths from their sides, these should be retained until the new side growths have formed their own roots, when they may be cut away from the parent plant and potted up, care being taken not to damage the roots.

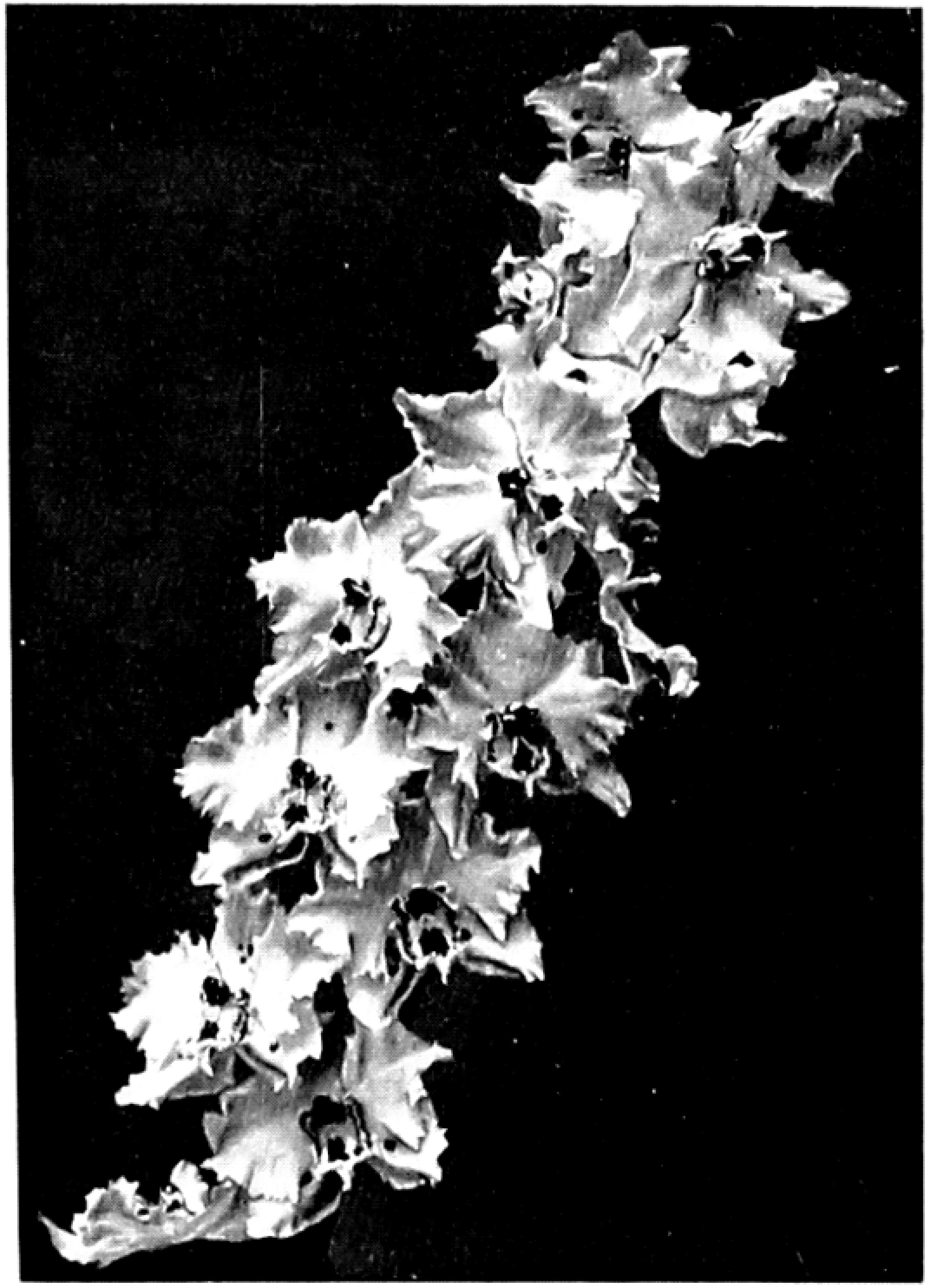
Cattleyas and their allies may be increased by division and this is done at the time of repotting, where the plants are large enough to stand dividing, as with a Cattleya that has made two leads, both of which have reached the edge of the pot and each of which has three or four pseudo-bulbs. Where it has been decided to repot such a plant, the rhizome should be severed a few weeks previously with a clean sharp cut, each lead retaining its three or four pseudo-bulbs. Thus we have the plant divided into three portions, the rear end which should have at least two or three bulbs retained and the two leads. Each of these may be separated when repotting and potted up singly, with the rear of each piece



Odontoglossum grande (*the Clown Orchid*)



Odontoglossum rossii majus



Above: Odontoglossum crispum

Left: Thunia gattonensis

touching the side of the pot, leaving sufficient space at the front for future growths.

In repotting Cattleyas the compost should be finished off in the form of a mound, brought well under to the leading growth, so that the new roots when they appear will immediately enter the fresh compost. It is, however, a long time before the subsequent growths made from the rear portion of the plant are strong enough to bloom.

Cypripediums, like Masdevallias and many other orchids, are best divided for the purpose of increasing one's stock at the time of repotting. Large plants may be carefully pulled to pieces and each piece that is showing new young growth may be potted up singly, or if desired, two such pieces may be placed together in the pot, with the new young growths facing opposite directions.

HYBRIDIZATION

The amateur with his modest greenhouse will often consider from time to time the question of hybridizing, making crosses from his own plants. It must be pointed out that there are limitations beyond which it is not advisable to go. The man who would like to 'try his hand' and who has little or no knowledge or experience at his disposal should keep strictly to crossing plants of the same family, for instance, Cymbidium with Cymbidium, etc. Even then strong healthy matured plants that are flowering at the same time should be chosen and then only those that are of good texture, colour, shape and size, each item of which should be taken into consideration. Having, however, decided to make a particular cross, the operation is comparatively simple.

The pollen masses of an orchid will be found on the apex of the column, exactly beneath the cap. The stigma is glutinous just behind the pollen masses and as soon as the bloom is fully developed it is ready to be fertilized. Selecting the first flowers on each spike to be crossed, carefully remove the pollen masses from the flower with a pointed matchstick or small tweezers and gently press on to the stigma the pollen taken from the other flower. Then take the plant and place it in a position out of harm's way and where the flower that has been fertilized is not likely to be damaged. If desired the plants that have had their pollen masses removed may be crossed the reverse way.

If a successful fertilization has been effected the flowers will droop and shrivel shortly afterwards when the petals and sepals must be removed at the base by trimming them off. At the same time the seed pod will show signs of swelling. During the time that the seed pod takes to swell and ripen the plant should be kept steadily watered and not allowed to get dry at the roots. The time taken for seed pods to ripen varies with different genera. As an example Cymbidium seed pods will ripen in about nine months. Orchid seeds are extremely fine, like snuff in appearance, and when the seed pod is nearly fully ripe, precautions should be taken against the seed being lost by placing a small paper bag over the pod.

Having successfully ripened the seed, the question of sowing it arises. For the amateur who has few facilities for this purpose, it is a good plan to sow the seed at the base of a plant of the same family. In selecting the orchid that is to act as foster parent, it is important that it should be a good healthy plant and one that will not require repotting for at least another year or so. The compost must also be in good heart, with not too much sphagnum moss on the surface, which should be trimmed closely. Before sowing the seed give the plant a good watering, then sprinkle the seed thinly and carefully over the surface of the compost. Great care must be used in subsequent waterings, or the seeds will be washed over the edge of the pot, but the plant must never be allowed to become dry or the results will be disappointing.

Another method which may be tried with a good chance of success is to sow the seed in a pan about 4 to 5 inches in diameter. To prepare this pan, fill it to about a ¼ of its depth with small crocks and over these place a quantity of chopped sphagnum moss and finer grade osmunda fibre, cut finely and well mixed together, packing this mixture firmly and evenly into the pan, using a potting stick for the purpose, just as though one was repotting an orchid, finishing off with a neat surface. Over this surface place a clean piece of old linen or canvas that has been well boiled and tuck the edges in all round the inside of the rim of the pan, making it smooth, with a slight rise towards the centre. Into the edge where the linen or canvas has been tucked in finely chopped sphagnum moss should be inserted, after which the pan should be immersed in rain-water and allowed to drain for a few hours, when it will be ready to receive the orchid seed. This should be sprinkled carefully over the surface. The pan may then be covered with a piece of glass and placed in a small propagating frame. The atmosphere in the propagating frame must never be allowed to get dry, but any surplus moisture on the glass must be wiped off from time to time. The pan containing the seeds must also not be allowed to get dry but should be carefully watered with a mist-like spray from time to time.

Orchid seed may be sown as soon as the seed is ripe, but where possible it is advisable to retain a portion of the seed for sowing early in the spring when days are getting longer, conditions for growing are better and the chances of success more assured. It is important that shading from strong sunlight be provided.

ORCHID SEEDLINGS

A few weeks after the seeds have been sown on the pans, minute green globules about the size of a pin's head should appear, from which the first tiny leaf will come. This very interesting progress may be studied with the aid of a magnifying glass and at this stage the tiny globules of life must be very carefully removed from the seed bed with the aid of a celluloid plant label split lengthwise, into the end of which a small 'V' shaped incision is made, producing a tiny fork. These seedlings should be placed in a previously prepared pan, containing a compost of the softer portions of osmunda fibre and sphagnum moss, all chopped up extremely finely, to which a little clean sand may be added, making allowance for complete drainage by placing ample small broken crocks at the bottom of the pan. These pans will accommodate some dozens of these tiny globules. They are carefully placed upon the newly-prepared bed and the pan is then transferred to a moist propagating frame, where a warmer and more even temperature may be maintained, and the pan kept well shaded.

At no time must the pan with its minute seedlings be allowed to become dry or the small young and tender roots which will have formed will suffer. When these roots have formed the seedlings may be potted up singly and placed at the warmest end of the greenhouse, still maintaining a moist atmosphere and keeping them well shaded. If all goes well, the young plants should grow steadily and the first small pseudo-bulb develop.

Young seedlings of Cymbidiums, Odontoglossums, Odontiodas and other cool-growing orchids should be kept at an average temperature of about 55° F., rising during the daytime, according to the weather. During bright sunny periods they must have extra shading, with additional moisture in the air. On such days a light dewing overhead is beneficial. Seedlings of Cattleyas, Dendrobiums, etc., require a temperature 5°, or slightly more, higher than the cooler growing orchids, otherwise the treatment is much the same.

During all this time cleanliness must be observed to ensure ultimate success and the steady growth of the seedlings. Should fungi or lichenous growths or moulds appear on the surface of the composts, the seedlings must be removed and fresh compost provided. Provision should also be made against attacks by insect pests, such as thrips. An occasional fumigation will be a safeguard against any serious damage. It is also a good plan to obtain a plant or two of *Pinguicula falcata*, usually obtainable from any orchid nursery. Put this plant, which is not an orchid, in the midst of the seedlings and it will attract the small 'moss' flies or midges, for its broad fleshy leaves are slightly glutinous; the flies stick on them and are thus destroyed. *Pinguicula falcata* also produces quite a pretty mauve flower, on a slender stem.

In due course the now independent young plants will require still more room for development. When they have made their first pseudo-bulbs they may be potted on again into a 2½-inch pot, where they will be allowed to stay until they have made their second and third bulbs. During this period and from now on, the seedlings may be treated in the same way as fully-established orchids, except that they are not given any resting period, but are grown steadily on throughout the year. Special attention must be paid to keeping them well shaded from direct sunlight, as they are still very delicate and will scorch easily if not protected. Ventilation should also be given with caution, taking care that there is no direct draught on to them. At the same time no over-watering must be allowed, or damping off is bound to occur. By the time the plants are ready to go into 3-inch or 3½-inch pots the usual compost will be used and the seedlings grown on until they flower, when the grower will enjoy the full fruits of his labours.

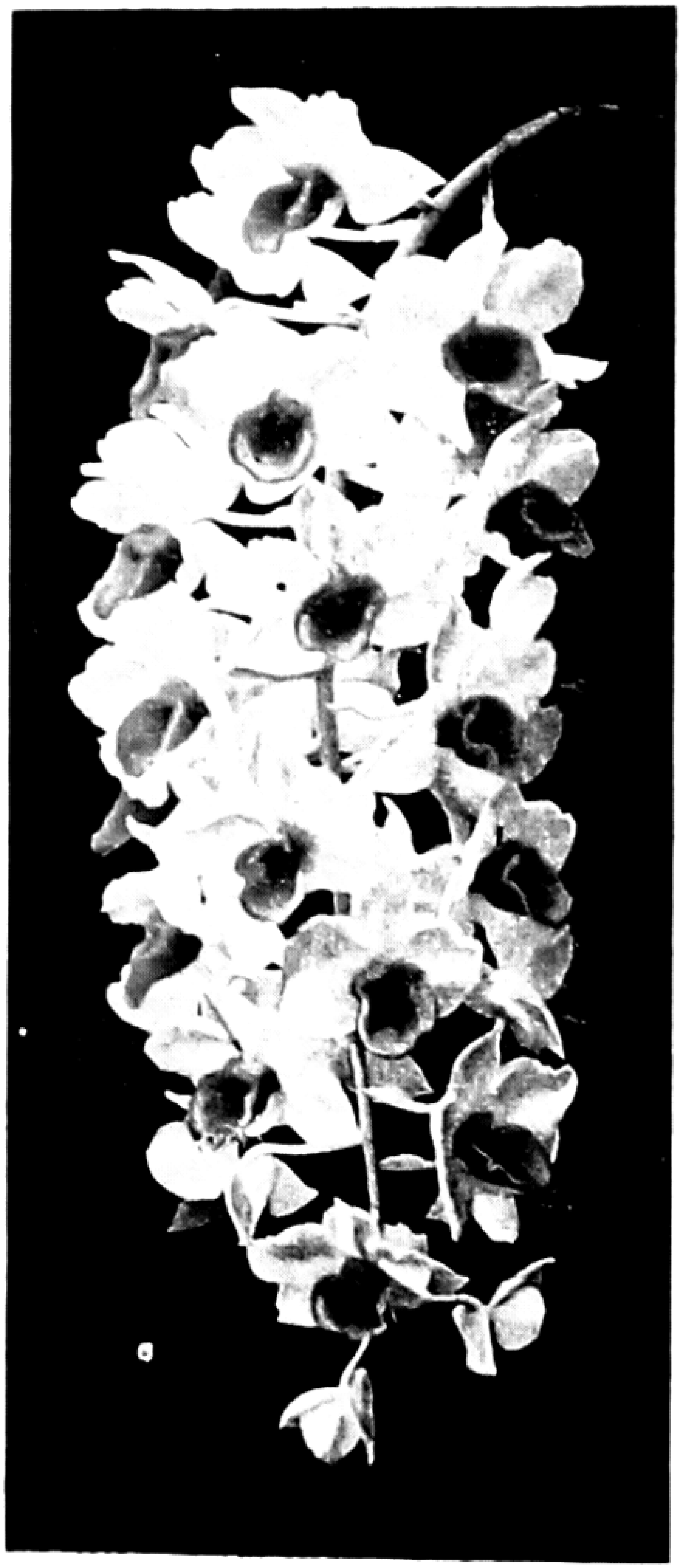
FLASK CULTURE

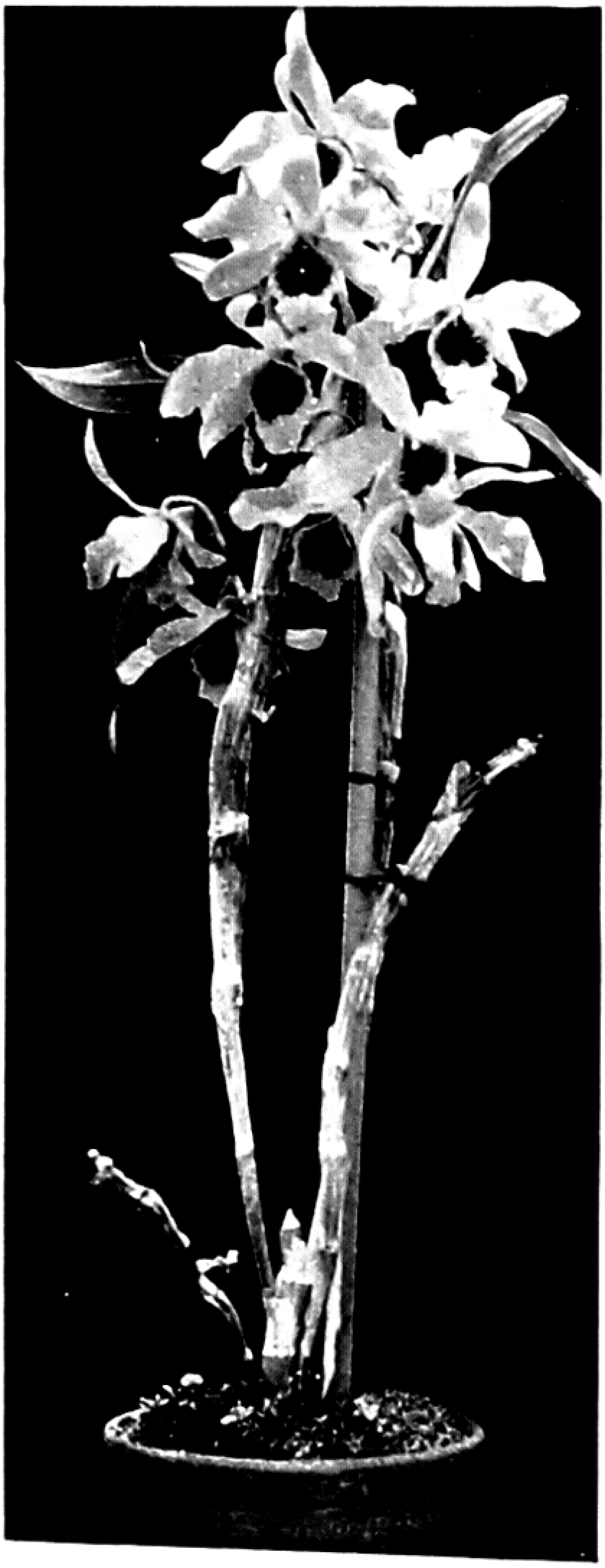
The more ambitious and scientifically minded orchid growers might like to try their hand at raising orchid seedlings at home by the flash culture method known as the assymbiotic process of the famous Dr Knudson. This, if properly carried out, greatly increases the percentage of seedlings obtained. Under natural conditions a great many seeds fail to germinate and many seedlings are killed by fungi in the early stages.

Under the flask system the seeds are germinated on sterile agar impregnated with the mineral salts essential for the growth of orchids. This mixture of agar and chemicals is contained in a glass flask sealed with cotton wool and precautions are taken at every stage to exclude fungi and bacteria of all kinds.

There are several formulae for this agar medium but the most popular, known as formula C, is as follows:

Right: Dendrobium thyrsiflorum





Left: Dendrobium Ainsworthii
(aureum *x* nobile)

Above: Dendrobium Austinii (Ainsworthii x Cybele)

Left: Dendrobium fimbriatum

Chemicals and Equipment required

1. Distilled water, 2 litres
2. Calcium nitrate, 1·00 gram.
3. Monobasic potassium phosphate, 0·25 gram.
4. Magnesium sulphate, 0·25 gram.
5. Ammonium sulphate, 0·50 gram.
6. Sucrose, 20·00 gram.
7. Ferrous sulphate, 0·025 gram.
8. Manganese sulphate, 0·0075 gram.
9. Agar (shredded), 15 grams.
10. Potassium hydroxide.
11. Hydrochloric acid.
12. Calcium hypochlorite.

A fine pair of metric scales.
A roll of non-absorbent cotton wool.
A glass stirring rod.
A long stemmed funnel.
An inexpensive soil testing outfit.
A large pressure cooker.
Twelve Erlenmeyer 250 cc. flasks.
Filter paper.

Preparing the medium

First, make cotton wool stoppers to fit into the necks of the flasks by rolling 2-inch strips of cotton wool, approximately 12 inches by 3 inches. It should be possible to insert these plugs using a screwing movement, without undue forcing.

Secondly, prepare the medium for the flasks by pouring 1 litre of distilled water (No. 1) into a double boiler, Heat this distilled water and add the ingredients, which should have been carefully weighed out on the fine scales. If you are not accustomed to weighing such minute quantities it is advisable to seek the assistance of a chemist. Chemicals, Nos. 2 to 8 should be added in that order, one at a time; dissolve each completely before adding the next on the list. Keep the contents simmering and stir constantly with the glass rod. Finally, add 15 grams of the agar (No. 9) and keep the mixture stirred and simmering on a gas or electric cooker until all the agar is thoroughly dissolved. When you have completed this, and before sterilizing, it will be essential to check the pH (hydrogen-iron concentration), which may be ascertained with the soil testing outfit, used as instructed. Should the prepared solution, when tested, turn red, the solution is too acid, in which case add a drop or two of potassium hydroxide (No. 10). Then thoroughly mix and test a small quantity again until you obtain the orange colour, indicating a pH of about 5·0, which is correct. If, in the first instance, the solution turns blue green, or yellow, it is too alkaline and should be counteracted by the addition of a drop or two of hydrochloric acid (No. 11). Continue to take tests, step by step, until the desired orange colour is obtained.

For Cypripediums (Paphiopedilums) add to the ingredients ·05 gram of Peptone to 1 litre of the nutrient and adjust to pH.6, a more neutral condition. The seed of Cypripediums is very hard and may take a long time to germinate.

When the medium is ready pour it gently into the 100 cc. glass measure and then into the Erlenmeyer 250 cc. flasks, using a long stemmed funnel for the purpose, which should not reach more than 1 inch from the base of the flasks. Insert the prepared cotton wool plugs firmly. The quantities given here should make sufficient medium for 7 flasks. Place the flasks upright in a large pressure cooker fitted with a perforated tray to prevent the flasks actually touching the bottom. Cover the bottom of the pressure cooker with about 2 quarts of water. The pressure cooker should be fitted with a dial pressure gauge. Secure the lid of the pressure cooker and proceed to heat it on a gas or electric cooker. As soon as the dial on the pressure cooker registers 15 lbs pressure, keep it at this pressure for a period of 20 minutes during which time the process of sterilization is taking place. When the sterilization has been completed, release all the steam and remove the flasks laying them on their sides with their necks resting upon a 1-inch deep rack, say overnight. If the work was carried out in the evening, the solution should have set by the next morning into a jelly with a thin film of moisture on the surface.

Wire loop

Before commencing to sow the seed you will have to make a wire loop, about $\frac{3}{16}$-inch across, from a piece of platinum wire. This is easily done by shaping the wire round a large nail. The other end of the wire may be inserted into a thin strip of glass tubing to make a handle.

Sterilizing the seed

The next step is to sterilize the seed for which you will require a $\frac{1}{4}$-ounce vial. Mix a proportion of the clacium hypochlorite (No. 12) in distilled water at the rate of 1 part calcium hypochlorite to 40 parts of distilled water. Shake thoroughly and filter off through the filter paper, using the clear solution to fill the vial 3 parts full. Use the point of a pen knife to place a portion of the seed into the vial. Cork the vial and shake it well for about 10 minutes, not more.

Seed sowing

It is from now on that every care should be taken to work in thorough cleanliness to prevent any possible contamination of the sterilized flasks. Place the flasks, still on their sides, upon the plate rack above a gas or electric cooker and work over a steaming bowl of water all the time. Dip your platinum loop into a reserve portion of the sterilizing fluid (No. 12) and insert it into the vial containing the seed (you will find it will pick up a portion of the seed with the film of the fluid inside the loop), at the same time unstopper one of the flasks and pass the wire loop gently over the jellied contents, leaving the seed behind, commencing at the back of the flask and repeating the movement towards the front. Restopper the flask at once. Work with well washed hands, kept wet. Care must also be exercised not to disturb the air more than possible and not to breathe directly upon the flasks or on the work in progress. After you have restoppered the flask, cover the end with a piece of cellophane held into position with a rubber band. Before replacing the cotton wool stoppers they should be scorched at the end to be inserted by passing them through a flame. Continue the process until all the flasks are sown and then place them in a warm and humid propagating frame, which should be kept at not less than 60° F and shaded from direct sunlight. The necks of the flasks should be resting upon a 1-inch rack to keep them level and undisturbed.

Success or failure

If after a few days any mildew or mould appears in any one of the flasks nothing can be done about it, except to repeat the process and hope that you will be successful next time. If all is well within the flasks the seeds will show the development of chlorophyll by turning pale green. They should continue to develop into tiny plantlets over a period averaging 9 months, by which time they should be ready for pricking out.

CHAPTER FIVE

Pests and Diseases

COMPARED WITH many other greenhouse plants, orchids seem to enjoy a comparative freedom from insect pests. Nevertheless orchids are not completely free from unwanted visitations, but with good cultural conditions and prompt attention when insect attacks are suspected, they are readily controlled and kept in check.

Routine controls

As with all greenhouse plants prevention is better than cure, therefore one should make a routine job of fumigating the houses, say every three weeks, which will prevent any insects gaining a hold. In smaller greenhouses the orchids should be sprayed regularly every two weeks or so with a good nicotine insecticide, used as instructed by the makers. When this spraying is being done particular attention should always be paid to the undersides of the leaves, applying the insecticide in a fine mist-like spray and endeavouring to wet the whole of the foliage, both on the surface and underneath, but avoiding the flowers of any orchids that are in bloom, or they may become spotted. On the whole it is easier and more advantageous to use a fumigant as a protection. Here again these must be used according to the maker's instructions.

When fumigating it is important that all the foliage of the orchids is dry or scorching of the leaves will result; on the other hand, the plants should not be dry at the roots and should be watered some hours previously. So that the operation will be more efficient, a good damping down of the house should be carried out before lighting the cones or canisters in order to make the smoke hang for a longer period. All cracks should be sealed off and the ventilators properly closed to prevent the escape of the smoke as much as possible

Having decided to use a fumigant, choose a day when the weather is mild, with little or no wind, and place the cone or canister in the centre of the pathway, away from anything inflammable and ignite it. Then leave the house immediately, securely closing the door. Usually the job is done in the early evening, or when the temperature is about 60° F. for the best results. Never fumigate in bright sunshine. It will be safe to re-enter the greenhouse by the next morning, when the house should be given a good ventilation to change and freshen the air. In larger houses where it may be necessary to use two, three or more fumigating canisters, according to the cubic capacity of the house, place the canisters as already described on the path at regular intervals, igniting the one farthest away from the door first and retreating to the doorway as each canister is ignited, getting away from the fumes as quickly as possible. Before igniting the cones make sure that no domestic pets are in the greenhouse.

For fumigating purposes, to find the cubic capacity of a greenhouse, one simply multiplies the width by the length by the height, deducting approximately a quarter from the height to allow for the slope of the roof to the eaves. Thus the cubic capacity of a house 10 feet wide by 20 feet long by 12 feet high to the ridge, would be $10 \times 20 \times (12-3)$ feet.

$$= 10 \times 20 \times 9 \text{ feet.}$$
$$= 1{,}800 \text{ cubic feet.}$$

INSECT PESTS

The insect pests that are most likely to attack orchids under cultivation are thrips, red spider, scale, mealy bug, and to some extent aphis, while woodlice, slugs, snails, ants and cockroaches may be troublesome at times. All of these are here dealt with in turn, but it is emphasized that with good culture and the right atmospheric conditions, none should prove a menace.

Thrips

The pernicious thrips, the first on the list, is a tiny insect hardly perceptible to the naked eye, but it is very mobile and will multiply rapidly if neglected. It therefore behoves the grower to take prompt action directly the first effects of the insects are seen. The first indications that thrips are present are usually a few tiny punctures, like pin holes, in the younger leaves of the plants. The pest will also attack flowers and buds as well as the leaves, completely spoiling them, for marks are always there. Prompt action must be taken, by spraying with a nicotine insecticide, as mentioned, or liquid malathion can be used, strictly avoiding any insecticide that has a paraffin content, as this is injurious to all orchids. Where any individual plant has been badly attacked, sponging each leaf separately with nicotine will be necessary. Alternatively, in larger collections, the best remedy is to fumigate the house immediately, using one of the proprietary DDT smokes, which will quickly destroy these pests when the maker's instructions are followed. These DDT smokes will also control woodlice, earwigs and some aphis, but not red spider.

Red Spider

Red spider is another very small insect, slow-moving and slightly smaller than a pin's head. It will increase fairly quickly, given the right conditions, but where correct orchid culture is practised with the required moist atmospheric conditions, red spider will not thrive. It will be seen, therefore, that if this insect gets a hold something is wrong in the cultural treatment of the orchids, for like thrips it prefers a dry heat, and will not thrive in the moist air that orchids require. The attacks of this insect may be observed on the young foliage. Both the surface and the underside of the leaves have a whitish appearance which becomes more plainly visible as the insects increase, eventually causing the leaves to turn prematurely yellow and greatly reducing the vigour of the plant. Spraying with liquid derris or liquid malathion is the remedy, or fumigating with an azobenzene smoke will be effective, damping down the house and closing all ventilators and sealing all cracks beforehand. As a further precaution, a second fumigation may be given after a lapse of about seven days.

Scale Insects

Scale insects will make their appearance from time to time and are sometimes introduced into the house on newly-acquired plants. As a precaution such orchids should be carefully examined upon arrival. The pests will attack all kinds of orchids and if left undisturbed will spread throughout a house, doing considerable damage by sucking the sap from the plants, causing the leaves to become misshapen and generally weakening the plant. A sharp look-out should always be kept for them, especially on the undersides of the leaves, on the pseudo-bulbs, and at the bases of Cypripediums, where they will congregate and multiply. Fumigation is of no avail against this pest and the best remedy is to spray the plants with liquid malathion or liquid DDT, or they can readily be removed by wiping them off with a small piece of linen rag dipped in DDT.

When a plant has once been infected, frequent inspections of it should be made to ensure that there is no repetition of the appearance of scale.

Mealy Bug

Mealy bug, so called because of its mealy appearance, is easily identified and attacks from it usually come about by neglect. It is usually found on the undersides of the foliage. The remedy is to spray with liquid malathion.

Woodlice

Some houses are more prone to harbour these pests than others and where they congregate, steps must be taken to keep them severely under control, for they can do a great deal of harm to young orchids by eating the green tips of the roots, especially those that are exposed to the air, such as the roots of Dendrobiums when they grow over the edges of the pots. Fumigating with a DDT smoke, as used for thrips, is effective. Liquid DDT watered on to the compost is also a good method of control. Traps may be set in the form of half a grapefruit, hollowed out, or potatoes, carrots, etc., similarly treated and placed in likely places and frequently examined. Paris green, which is a poison, may be tried mixed with bran, but the best preventive is cleanliness in the house, ensuring that no rubbish, etc., is allowed to accumulate under the stagings.

Ants

These can be a great nuisance in a greenhouse; they run over plants and will transfer scale from one plant to another and even pollinate the flowers in their travels, although not actually doing any direct damage to the orchids themselves. Ants were at one time difficult to eradicate, but today they are easily destroyed by using DDT powder, or proprietary ant destroyers may be purchased which will eliminate them entirely.

Cockroaches

These like dry warm conditions and are sometimes attracted to the boilers and hot-water pipes. Where they are troublesome, a beetle poison should be used and if possible their entry, probably near the boiler, discovered and stopped. Cockroaches come out of their hiding places mostly at night time and will eat the flowers. They should be searched for after nightfall. Regular attention to all dry corners, etc., when damping down, will help to discourage them.

Aphis

Aphis or greenfly will occasionally make an appearance, but these are easily dealt with by the routine fumigation advocated for thrips. They rarely become a nuisance as far as orchids are concerned.

Slugs and Snails

These pests, if not controlled, do enormous damage, and can be a perpetual source of annoyance. Every effort should be made to keep them well within bounds, good culture and cleanliness in the house playing its part in keeping these pests down. It seems that their eggs are often imported in the sphagnum moss and by other means. Small black slugs will play havoc and must be rigorously searched for and destroyed wherever signs of their depredations are noticed.

These small slugs and also small snails will eat into and hollow out the pseudo-bulbs of Cymbidiums and other orchids with impunity, living all the time inside the pseudo-bulb, from whence they must be extracted and destroyed. Where such pseudo-bulbs have been badly eaten into, the wound should be treated with powdered charcoal. To stop the bleeding or exudation of the sap, the plants must be watched and further attacks prevented.

Slugs and snails are also very fond of new roots, young growths and young flower spikes. They will eat into new buds, completely spoiling any potential flowers. Slugs eating into the side of a flower spike will often cause both loss of buds and undersized blooms by checking the flow of the sap. Cotton wool placed round the base of the flower spikes of all orchids as soon as they are seen acts as an effective barrier to these pests. There are many effective slug and snail killers now on the market, which may be placed in small heaps among the plants on the staging and other places. These preparations attract the slugs and snails, they eat them readily and are usually found dead next morning, when they should be collected and removed. Should, however, a particular plant be attacked and the invader avoid detection, a visit during the night will usually find it out of its hiding place. Another good method is to shine an electric torch at night against the back of the flower spike sheath suspected of harbouring one of these pests; if the slug is inside it will be readily seen, and it can be removed and destroyed.

From the foregoing it will be seen that there are only about three serious pests to contend with; thrips, red spider and slugs or snails. Of these perhaps the latter are the worst, for they are a constant source of danger and not so easily controlled as are thrips and red spider, which can be readily dealt with by regular fumigation. Cleanliness in the house and good cultural conditions are added safeguards against attacks by insect pests of all kinds.

Bees in the vicinity of the greenhouse may make themselves a nuisance at times, entering the greenhouse through the open ventilators. When this happens and there are many orchids in bloom the bees should be caught and destroyed. A single humble bee will go merrily from one flower to another pollinating each bloom it visits, much to the grower's annoyance. Once orchid flowers are pollinated they collapse quickly and are useless.

DISEASES AND DISORDERS

There is little one can say on actual diseases of orchids, for fortunately they are very few and nearly always when a plant becomes diseased in any way, it can usually be traced directly back to faulty culture, when the remedy becomes obvious by correcting the method of culture.

Black Spot

One of the chief reasons for an orchid becoming unhealthy is too cold an atmosphere which is too heavily charged with moisture through lack of proper ventilation. This is particularly so during the winter months. Under such conditions the disease known as Black Spot will develop and if not treated will spread rapidly, causing the pseudo-bulbs to rot and become putrid.

As soon as this disease is seen the affected part must be cut cleanly away and the cut surface rubbed with powdered charcoal until the wound has sealed over. *Vanda caerulea*, Cattleyas and other orchids are sometimes thus affected. Every endeavour must be made to determine the cause of the infection and cultural treatment amended accordingly. Probably insufficient ventilation alone may have been the cause, for it must be remembered that all orchids require fresh air which must be given whenever possible. Alternatively it may be a combination of all three causes. Cattleyas and other intermediate house plants grown or attempted to be grown under cool-house conditions will court similar disaster. All too frequently plants are overwatered, causing the loss of roots, damping off of young growths and stagnant compost. If these occur the plant must be taken out of its pot, all dead roots cut away, and all decaying compost removed. The plant must then be repotted into the same sized pot or possibly one a little smaller with extra drainage allowed and good fresh compost. Such plants must afterwards be kept well shaded and watered very carefully, allowing the compost to dry well out between each watering to encourage good new root action.

Another cause of trouble is the continual dripping of condensed moisture from the glazing bars on to a particular plant, quickly reducing a healthy specimen to a poor condition, causing the young growths to rot away, and keeping the compost in a perpetually sodden state. In such conditions the roots will quickly die off and the plant will finally die.

The remedy, where a plant is taken in time, is to place the orchid in another part of the house, upon an inverted flower pot, in a shady and warmer position, where surplus water may drain away and the compost dry out. These affected plants must be watched until they show signs of recovery, when continued careful watering must be carried out until a new healthy root system has been built up again.

In the meantime, the cause of the drip from the rafters must be rectified. This may be done by fixing a narrow strip of wood on to the sides and the whole length of the rafter, to carry any surplus condensed moisture away. Rain coming through the roof and continually dripping on to a plant has the same result. The remedy is the same for the plant and the leak in the glazing bar should be sealed off, either with fresh putty or any of the mastic preparations now on the market, especially recommended for greenhouse glazing.

Once an orchid has been allowed to deteriorate to any great extent, the period of recovery is a long one and many a plant is lost through the mistaken kindness of overwatering. It would appear that many a would-be amateur orchid grower has given up in despair for this reason. The question of whether to water or not is often a problem to the amateur, and to be on the sate side it is wiser to allow a plant to dry out between waterings. If in doubt, better wait another day or two before watering.

Given reasonable culture with proper attention to damping, temperature, ventilation and above all cleanliness in the house, and freedom from insect pests, success with orchids will automatically be assured and the grower will reap the benefit of his labours.

2. THE COOL HOUSE

CHAPTER SIX

Cool House Monthly Notes

January

IT SEEMS appropriate that one should begin this subject in the month of January for at this time of the year, with its usually dull weather and when many orchids such as Dendrobiums, Coelogynes and *Odontoglossum grande* are at rest, there is little immediate work to be done. In severe weather the ventilators will have to remain closed for long periods, but air should be given whenever a favourable opportunity occurs in any mild or sunny periods. However, the ventilators must be used with discretion, opening them only a little at a time on the leeward side of the house, without allowing a perceptible drop in temperature. Air thus given will freshen up the atmosphere, which should never feel 'muggy' when one enters the house. With a little practice the grower will be able to tell on entering a house whether the inside conditions are in a desirable state or not.

Usually, during January, one damping down in the morning will be sufficient for the day, but should the atmosphere feel 'dry' by about midday, a second light damping may be given, but precautions should be taken against the atmosphere becoming heavily charged with moisture, combined with a cold temperature. Damping down should never be undertaken if the thermometer registers below 50° and should also only be carried out on a rising temperature, never when the temperature is falling.

Watering of the plants must be done very sparingly and no plant must be allowed to remain in a sodden condition. It is far better to err on the dry side, allowing the plants partially to dry out between each watering. Do not be afraid to defer watering for a few extra days. If there is any doubt it must be remembered that where orchids have pseudo-bulbs, these bulbs are the natural storehouses of the plant and, unless signs of shrivelling appear, there is no urgent need for water. Cypripediums and other orchids that have no pseudo-bulbs should, however, not be allowed to get dry at the roots. Only sufficient water will be required to keep them going, and even then it will only be necessary at longer intervals, for plants at this time of the year take longer to dry out, unless they have to suffer dry heat from the hot-water pipes. This must not be allowed and conditions must be remedied without delay.

Temperatures command considerable attention at this time of the year and should be watched, keeping to the required minimum whereever possible, 45° to 50° F. at night, rising to 55° to 60° F. or higher by day. An occasional drop below the recommended minimum will do no harm, provided the plants are on the dry side, but should not be allowed to happen if it can be avoided.

No shading will be required, but where lath blinds or roller blinds are in use, these may be used to cover the house at night time, as they will help considerably to conserve the warmth and reduce the fuel bill. With the water pipes more or less in continual use, thrips may make their appearance, when fumigation should be carried out without delay.

February

This is sometimes a changeable month, especially towards the end. Discretion, therefore, plays an important part in the cultivation of orchids. During the early part of the month, treatment is much the same as for January, but as the month advances and the days lengthen gradually, bright periods of sunshine are likely, accompanied by cold lifting winds. Ventilation in such circumstances will require careful attention and the house should be given only a little air at a time, always on the leeward side.

More heavy dampings in the mornings may be given, but the house must not be drenched with water. Often a second damping about midday may be necessary, but the house must be moderately dry by nightfall. Efforts should be made to see that temperatures do not drop below the required minimum as for January.

A little repotting may be started towards the end of this month, beginning with green-leaved Cypripediums that have flowered and have new growths. Large plants may be split up and divided, but each portion should have at least two new growths retained where possible. Blinds should be used at night, as suggested for January, to conserve as much warmth as possible. Orchids that are at rest should be examined from time to time and if any signs of shrivelling are seen a good watering should be given, remembering that to give an orchid just a trickle of water is worse than useless.

March

This is perhaps one of the most tricky months of the year, when we find ourselves seemingly betwixt and between the seasons. Days are lengthening and the light is more powerful; bright sunny days accompanied by biting east winds are followed by frosts at night and so on. Such variable conditions call for constant attention according to the immediate weather.

Damping must be varied according to the weather, often changing from day to day, but with the rapidly increasing power of the sun two thorough dampings a day will often be required, whereas during dull periods one damping will still suffice. Should the weather become extra sunny and warm without any cold winds, three dampings a day will be required, but not when a frost is likely to occur during the night.

Fire heat will still be necessary at night and temperatures should not be below 50° F. then, rising in the daytime to 60° F. or more with the sunshine. Shading should now be used whenever necessary, especially where young plants are concerned or where new growths have appeared, for these, being tender, are quickly affected by sudden bursts of sunshine. Where lath or roller blinds are used one has far more control over varying conditions, but where such blinds are not installed shading of some other kind must be fixed. 'Summer Cloud' should be applied without delay or the glass painted as described in Chapter Two. There are also other preparations on the market which may be used.

Ventilation may be given in moderation, but not in such a way as to lose the moisture, and, as always, on the leeward side of the house, thus avoiding draughts. The repotting of Cypripediums should now have been completed. Cymbidiums which have young growths and have filled their pots with roots or have reached the front edge of the pot, but are not in flower spike, may be repotted from now on as may Dendrobiums at this time of the year, together with any orchids that are showing signs of awakening after their season's rest.

April

Very little fire heat will be required during this month and there are many days and nights when it may be dispensed with altogether. A watchful eye should, however, be kept on the weather, and if a drop in the outside temperature appears imminent, especially towards the evening, then a little fire heat should be given, keeping the night temperature between 50° F. and 55° F., rising to about 65° F. or higher by day time.

Ventilation may be given more freely, opening the ventilators a little in the morning and gradually increasing the air towards midday, but allowing no draughts and shutting down again in the early afternoon to conserve the natural sun heat for as long as possible.

Regular dampings must also be attended to, damping down in the morning and at midday and, weather permitting, giving a light damping in the early afternoon. The first damping in the morning should be a thorough one, making sure that all parts of the house are damped down —against the walls, underneath the staging, all paths and between the pots on the staging. It is important that the damping between the pots on the staging is not done haphazardly and no water should get into the pots themselves. The second damping of the day need not be quite so heavy, and the damping between the pots may be omitted, but on bright sunny days the plants will greatly benefit from a light spraying overhead and a syringeing on the undersides of the leaves. The foliage will then be dry again before nightfall. No excess water must be allowed to remain on them overnight especially in the axils of the leaves, as this is likely to encourage rotting. Cymbidiums, however, appreciate and can stand a little heavier spraying overhead and underneath the foliage, although they too must also not have any excess water on the leaves overnight.

The plants will need to be watered more frequently and when this is being done make sure that each plant gets sufficient water, thoroughly soaking the compost. Where a plant has inadvertently become bone dry, it is advisable to place the pot up to its rim in a bucket of rain-water, allowing it to remain there until thoroughly soaked through. Never, however, water a plant if the compost is still wet. Such treatment only leads to disaster. It is far better to leave such plants until the next watering day.

Shading will now be in general use and must be applied on all occasions, 'Summer Cloud' or permanent shading being kept on throughout the summer and, if necessary, a second coat can be applied to the glass. General repotting may now be proceeded with, except for Cymbidiums which should have been completed last month. Odontoglossums and similar plants should be repotted and pushed on without delay, as the plants finish flowering.

May

Fire heat from now on will not be required, except perhaps in exceptionally cold districts where there are occasional night frosts in early May. In districts where it is safe to dispense with artificial heating, the heating apparatus in use during the winter months should now be overhauled, cleaned and stored away until required again. Coke and anthracite boilers should be thoroughly cleaned out and all ashes removed, the fire bars removed and cleaned, the chimney swept, and the boiler doors left wide open to prevent condensation and consequent rusting up during the time the boilers are not in use. Do not, however, drain the water from the hot-water pipes, but keep them 'topped up' as evaporation takes place. Finally, all pipes should be given a coat of vegetable black and linseed oil. After this all will be in good order when fires are required again later in the year.

The houses will now require at least three dampings daily, and in hot weather light spraying overhead will assist the plants considerably as well as preventing temperatures from reaching the extreme. As the plants will be drying out more rapidly, more frequent waterings will be required, bearing in mind the old rule not to overwater.

Ventilation will now be considerably increased compatible with retaining good moist atmospheric conditions. During favourable weather a little ventilation may be left on all night, much to the benefit of the plants, thus avoiding any stuffiness in the house. Shading will, of course, remain in place and only be removed at sundown, being replaced next morning when the sun begins to shine upon the house. Where the house is in an exposed position and lath or roller blinds are in use, it may be found advisable to apply a coat of 'Summer Cloud' or permanent shading to assist in keeping temperatures down to about 55° F. by night, rising to 75°F. in fine weather.

All plants may be more freely watered, Dendrobiums enjoying frequent and copious waterings where the drainage is rapid. Most repotting will now have been completed and any plants that have not been attended to should be repotted, where necessary, before the end of the month.

June

Summer temperatures will now prevail and again extremes must be avoided by adequate shading and ventilation. To ensure a plentiful supply of moisture in the atmosphere, increased dampings should be carried out and syringeing of the undersides of the leaves together with overhead sprayings. Ventilation should be given more freely at night when the weather is favourable.

The plants may be watered more frequently, as there is little danger at this time of the year of over-watering. Go over the plants each day and see whether any plant requires water. This is usually indicated by the surface of the moss assuming a whitish or greyish appearance. Also, if a pot lifts lightly, water should be given at once, for orchids will deteriorate if allowed to suffer from drought at the roots during the summer months.

Where signs of thrips or red spider are seen, steps must be taken as advised in Chapter Five.

July

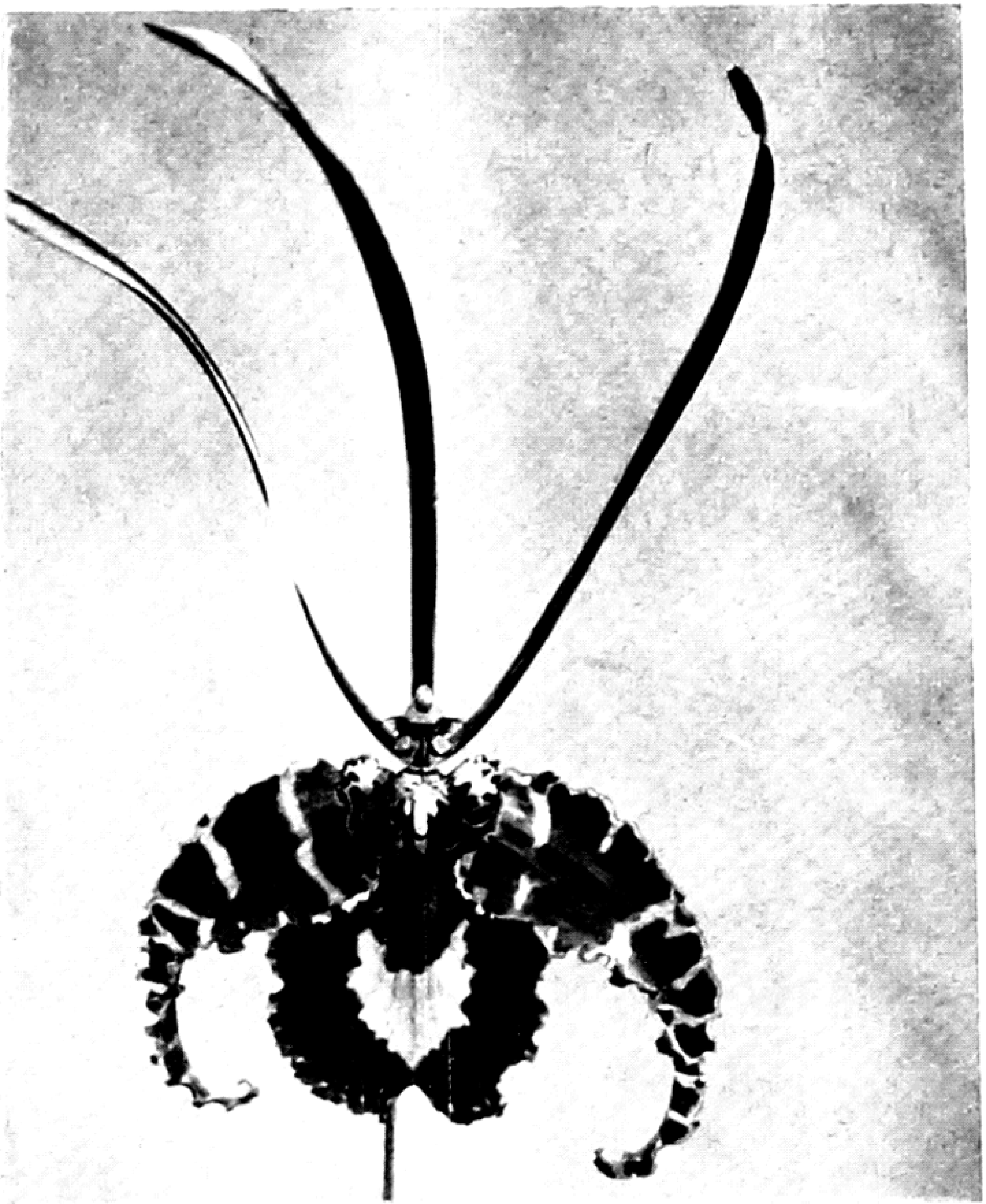
All plants are growing steadily at this time and the treatment is practically a repetition of that advised for June. Ventilation should be given at night when practicable. Where the sphagnum moss in the compost has overgrown to such an extent as almost to smother the pseudo-bulbs, it should be trimmed back neatly, for, although well-grown moss has a very pleasing appearance, it is not conducive to good healthy orchid growth, since it prevents the free circulation of air around the base of the plant. There is an old adage among orchid growers that where the sphagnum moss grows freely, the plant is doing well, but this is not necessarily an indication of the welfare of the plant.

August

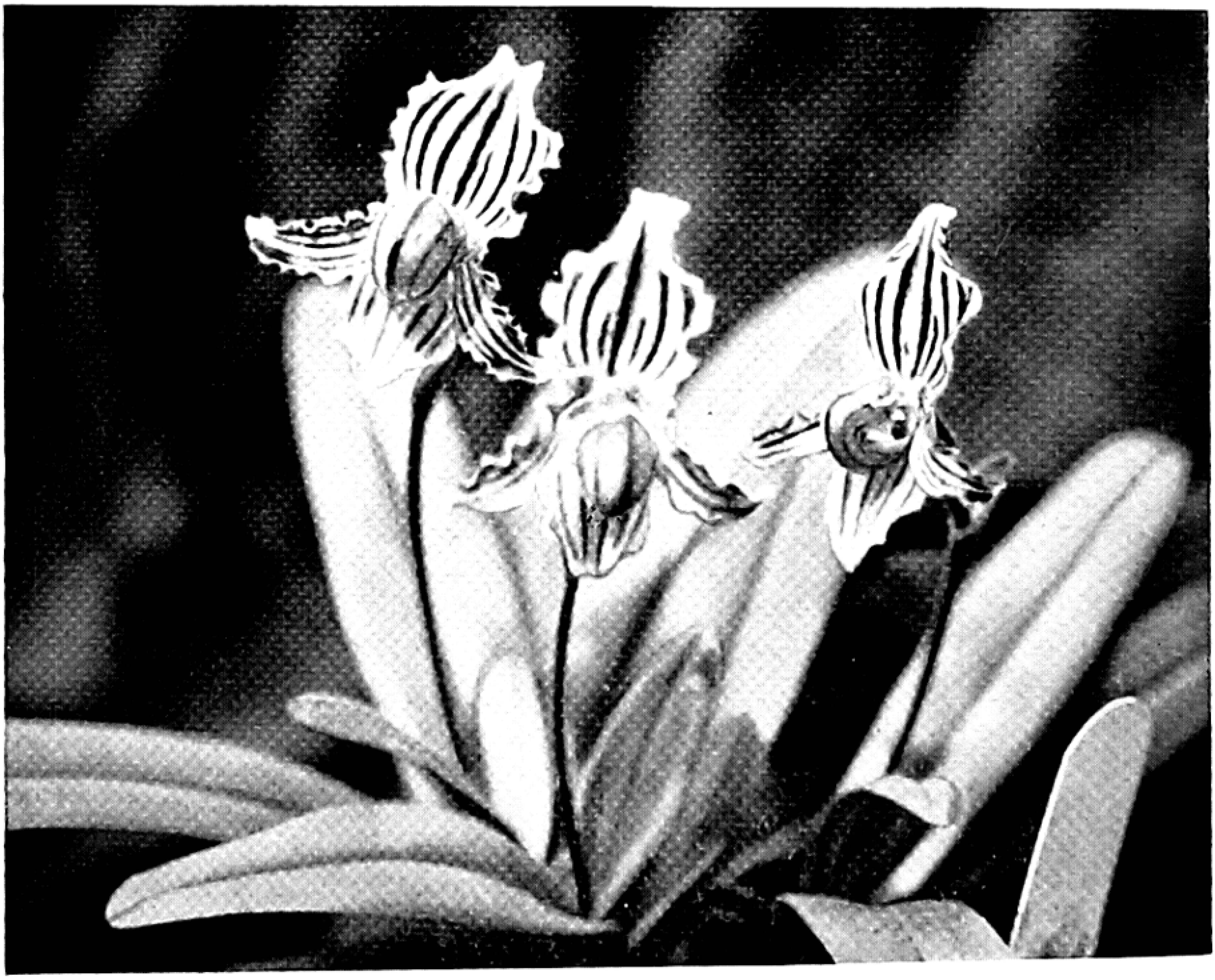
Ventilation may be maintained, with steady circulation of fresh air, as outside conditions are much the same as those in July, although the days are now getting shorter and the nights are beginning to have that autumnal atmosphere and are usually a little cooler, to the benefit of the plants. Night air may still be given, but in moderation.

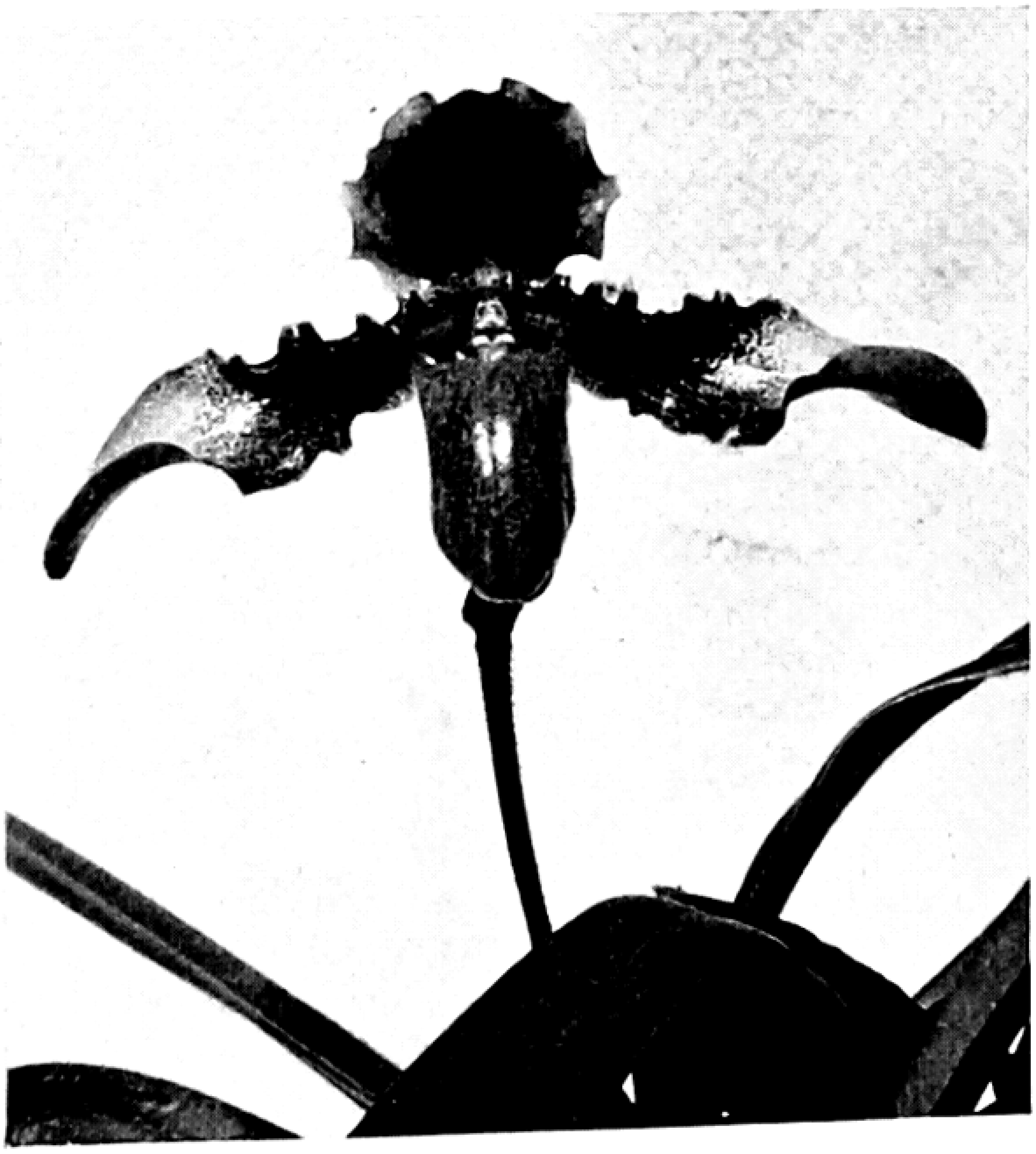
Damping down as usual will be necessary and watering of the plants continued. Where permanent shading is in use, this may now be gradually thinned, if this has not already been done by normal weathering. A good plan is to wipe the shading off in strips, giving the effect of a lath blind, thus allowing the plants to be in alternate shadow and sunshine. The sun passing in this way over the plants, which should now have nearly completed their season's growth, is insufficient to do them any harm. Plants that are now in this state should be assisted, where possible, to make good solid pseudo-bulbs and, therefore, water is still essential for completing their growth.

Towards the end of the month, those plants that have already made up



Above: Epidendrum fragrans *is a delightfully scented species*
Right: Oncidium papilio (*the Butterfly Orchid*)





Above: Cypripedium fairieanum

Left: Cypripedium hirsutissimum

their pseudo-bulbs will require less water and may be allowed to dry out partially between each watering. Continue to keep a sharp look-out for any insect pests and apply the usual remedies. Slugs should be searched for and destroyed, or slug killer used where they become troublesome.

September

During this month the plants must be watered more carefully. Study each plant before watering it and make sure that it is really in need of water. Permanent shading may be further reduced about the middle of the month allowing more light and air to assist in ripening the season's growth and encouraging the plants to produce their flower spikes. This applies more particularly to Cymbidiums. Ventilators will accordingly remain partially open. At night a little air may be left on to maintain fresh conditions.

Damping will still be required, but perhaps two dampings a day will suffice, dispensing with or reducing that given in the afternoon. Overhead spraying should now be discontinued, except on bright sunny days, when it must only be done if the immediate weather conditions allow, and early enough in the day to ensure that all foliage is dry overnight. Temperatures may fall by early morning to 50° F., rising to 65° F. or more during the day.

Towards the end of the month the heating system should be tested to ensure that it is in proper working order. Where coke or anthracite boilers are used, see that no flaky rust has accumulated in the chimney, if it is an iron one, paying particular attention to the bends where the chimney is connected to the boiler. If any rusty condensation is present in the boiler itself, this must be scraped off to make all clean and ready for immediate use should the occasion arise. Finally, examine the expansion tank and top up with water if necessary.

October

At the beginning of this month fine warm sunny weather is often experienced, but the cold nights will make fire heat necessary at night time. Later, as the weather turns colder, a gentle warmth may be given during the day time as well, combined with steady ventilation to maintain a fresh atmosphere, but closing the ventilators again in the early evening.

Damping will be reduced to once or twice a day and overhead spraying discontinued. The first damping should be thorough, with a lighter damping later in the day. As in September, watering will require attention according to the individual requirements of each plant.

Cymbidiums should now be showing their flower spikes and these plants will require normal quantities of water, together with any other orchids that are in bud or showing their flower spikes. It is a mistake to withhold water from these for any length of time. The repotting of Odontoglossums during this month should be completed and the temperature may be kept at about 50° F. by night, and 60° by day. Day temperatures will increase naturally during spells of fine weather.

November

The remains of any permanent shading should be completely removed at the beginning of this month. Cold damp weather may now be expected and, although November fogs are not nearly so bad as they used to be, especially in the London area, they may still be expected and, during such weather, the house must be kept closed until the fog has dispersed, endeavouring to keep an even temperature in the house. At such times damping may be dispensed with, unless the atmosphere becomes dry through too much pipe heating being used, when a light damping may be given. When the weather improves an additional damping may be given each day and those plants that are still making growth may be watered.

Plants that are now inactive will only require infrequent watering, sufficient to prevent the bulbs from shrivelling. In general this is a quiet month for the grower and any odd jobs that require doing can be attended to. Temperatures should be kept at 50° F. at nights—although a slight decrease during cold nights may be unavoidable—and allowed to rise at will during the daytime to a minimum of 58°.

December

Although fire heat will now be in continual use, any excess should be avoided. Too much heat only encourages thrips and other insects, apart from creating too arid an atmosphere. Accordingly, damping down should be done in relation to the amount of fire heat given. Ventilation will not be possible on many days, but where opportunity occurs a crack of air should be given, avoiding any cold draughts. Watering will require more careful attention and the danger of over-watering must be guarded against, especially where difficulty is experienced in maintaining the minimum temperatures which are 45° to 50° by night and 55° to 60° by day.

CHAPTER SEVEN

Cool House Orchids

CYMBIDIUM

FOR MANY years the Cymbidium was very much neglected, arousing little interest in comparison with many other orchids and only a few species were considered of sufficient interest to be included in a collection. Chief among these were C. *lowianum* and C. *traceyanum*, both of which are still worthy of a place in any collection and have been used extensively as the original basis for many fine hybrids. C. *lowianum*, a native of Burma, usually flowers in early spring, carrying fine long spikes of blooms, from fifteen to thirty flowers on a spike. The flowers have yellowish green petals with a crimson blotch on the lip, and are long lasting. This plant benefits by being allowed to grow on into a large specimen, making a fine show when in full flower.

C. *traceyanum* is another desirable species, which blooms during the summer, bearing large, slightly scented flowers on strong spikes, carried fairly erect. The petals are yellowish, tinged with olive green and striped with crimson. Other species include C. *giganteum*, flowering during the winter and bearing spikes of seven to fifteen flowers, yellowish green striped with red. C. *insigne*, which blooms in spring, will often give a spike 4 feet high with many flowers of light rose shade, with lip marked rose-purple.

Through the activities of the plant breeders, who have produced many fine hybrids in recent years, the Cymbidium has become very popular. There are today untold numbers of fine plants of the latest crosses from carefully selected parents from which the amateur has an unrestricted choice. It is due to this development that the Cymbidium species have to a great extent lost their popularity. At one time they were considered necessary for any collection but there is no doubt that, in general, there is no comparison between a species and the modern hybrid, with its wonderful range of beautiful colours and pastel shades, which include yellows, pinks, whites, old gold, green and many other tints.

Cymbidiums are very suitable for the amateur, being among the easiest of cool house orchids to grow, for they will withstand more extremes of conditions, and temperatures, and put up with more neglect than any other orchid and still give fine sprays of flowers.

The flowers will often last for nearly three months if left on the plant and this longevity is another desirable asset where the amateur is concerned, both for his own immediate pleasure or when the blooms are used as cut flowers, for which purpose they are eminently suitable.

In fairness to the plant, however, it is recommended that the flower spike should be removed about three weeks after the flowers are fully open, by which time the blooms are fully developed and have become 'set'. Such sprays placed in water indoors will last a further five or six weeks and their beauty is greatly enhanced if a little fern or feathery foliage is added to them. The cutting of the spray should be done to relieve the plant of the strain of supporting the large flower spike for such a long time. When the flower spike has been cut, give the plant a rest by keeping it well shaded and withholding water for a while. Afterwards it may be repotted, but only if this is really necessary.

Cymbidium hybrids, that is to say, plants that have resulted from the 'crossing' of two selected parents, show considerable variations in the colours, texture, size and contour of their flowers just as in a family no two children are exactly alike. For instance, where the flower of one of the two parent plants is bronze and the other beige colour, it is likely that among the seedlings some will be white, some cream, ivory, yellow, old gold, green, etc., with variously marked lips; some spotted, others more heavily marked and striped or blotched. Among these there may be a few of really outstanding merit but all are beautiful.

Young seedlings of tried parentage can be purchased at reasonable prices and grown on to the flowering stage and will prove a sound investment for the amateur. Seedlings that have already flowered naturally command a proportionately higher figure, for at this stage a Cymbidium may already be 6 or 7 years old. It is, therefore, an advantage to purchase, at considerably lower prices, plants that require growing on for, say, another two years or, where one has not the patience, plants that require only about another 12 months' growth may be obtained.

If allowed to grow on without division Cymbidiums make handsome specimen plants and fine plants are grown in 10- or 12-inch pots. They make a wonderful sight when in full flower and may occupy pride of place, preferably on the centre staging where there is one, or on the staging at the end of the house. They will also succeed in a conservatory with other plants, or with a grape vine, with the average cool house temperatures.

Cymbidiums make large fleshy roots and are strong growers, but by their nature require a more retentive compost. This should consist of two parts of fibrous loam, one part of osmunda fibre and one part of sphagnum moss, with which should be incorporated some finely crushed brick rubble to assist in keeping the compost open. A sprinkling of hoof and horn meal may be mixed with the compost and a small sprinkling of ¼-inch bones may be placed among the crocks at the bottom of the pot. Cymbidiums are gross feeders and plants thus potted up should not require further attention for about another two years or so.

Repotting

When repotting all dead roots should be cut away and any old leafless back bulbs may be removed, together with a portion of the old compost at the rear, leaving the front intact. The plant is then placed in the pot with the rear of the plant touching the sides of the pot, thus leaving sufficient space at the front and sides of the plant for the new compost to be packed in. This will allow ample space for the more or less forward growth of the plant. All plants that have been repotted should be kept well shaded and not watered for a few days, the stout pseudo-bulbs being capable of maintaining the plant for this period. A daily light spraying of the foliage overhead is beneficial. When the plant is finally watered, give it a thorough soaking, making sure that the whole of the compost is wetted throughout, after which do not water the plant again until it is partially dried out. Repotting may be carried out during the early spring and after flowering, as already mentioned. The plants should be kept shaded throughout the summer, which is the growing period, and all new growths produced earlier in the year should have practically completed their new bulbs by the autumn. In the autumn, therefore, the shading may be gradually reduced and more fresh air given to hasten the hardening and ripening of the pseudo-bulbs. By the end of September all shading should have been removed and the flower spikes will begin to make their appearance. As soon as these are long enough they should be protected by a band of cotton wool, to prevent slugs from ascending the spike and attacking the new young shoot. In the early stages it is difficult to judge whether the new shoot appearing is a flower spike or a new growth forming but generally a flower spike is slightly rounder and fatter than a growth. Where such a spike has appeared, it will not be until after Christmas that the flowers may be expected, and as the spike grows it must be supported with a cane, bearing in mind the natural character of the spray. If the spike is not supported in this way there is a danger of the stem breaking under the weight of the flowers.

Where the old, hard, leafless back-bulbs are removed at the time of repotting, not too many must be taken away, sufficient bulbs must always be left on the plant itself. For instance, with a plant that has seven mature bulbs, two of the rearmost may be taken away, sometimes three, leaving four or five bulbs on the plant. Having taken off the 'back-bulbs', separate them and pot each one individually into a small pot containing a compost of equal parts of osmunda fibre and sphagnum moss. The bulb should be inserted firmly, but not too deeply, since any young growth that is made will be produced from the base of the bulb. When potting up the back-bulb, do not forget to insert a label with the name on it. Cymbidiums may also be increased by division where a plant has produced growths in either direction, but since they do not always take kindly to division it should not be practised except with larger plants.

Cymbidiums require plenty of fresh air which should be given whenever possible and night air during the warmer months is an advantage. Watering should not be overdone as the pseudo-bulbs are capable of keeping the plants going. It is safer for the amateur to allow the plants to dry out partially between each watering than to overwater. Shading will be required from early March and throughout the summer, and gradually lessened in the autumn, and removed in early October.

CYMBIDIUM HYBRIDS

The following Cymbidium hybrids, showing the parentages, are only a few of the very many fine hybrids available.

C. Balkis (Alexanderi Westonbirt x Rosanna)
C. Edzell (Ceres 'F. J. Hanbury' x Lysander)
C. Jason (Alexanderi Westonbirt x Miranda)
C. Madonna (Alexanderi x Mem. P. W. Janssen)
C. Olympus (Alexanderi Westonbirt x Vesta)
C. Pearlstream (Pearl 'Magnificum' x Gulfstream)
C. Rusper (Pearl 'Magnificum' x Veronique)
C. Seaborne (Airborne x Ceres var F. J. Hanbury)
C. Stourbridge (Coningsbyanum x Ruskin)
C. Torbay (Nam Khan x Pearl 'Magnificum', F.C.C.)
C. York (Shina Black x AlexaderiWestonbirt, F.C.C.)

ODONTOGLOSSUM AND ODONTIODA

Odontoglossum hybrids and Odontiodas in their many varieties are probably the most beautiful of orchids for the cool house and they command an important place in an orchid collection. In fact, a whole section may well consist of Odontoglossums and Odontiodas alone, where one wishes to specialize. The flowers are as variable as those of hybrid Cymbidiums, no two plants being exactly the same. The pseudo-bulbs are ovoid, each having a pair of terminal leaves with sheaths each side from the base of the pseudo-bulb. It is from this space between the sheath and the pseudo-bulb that the young flower spikes emerge. The flowers when fully developed are often large, being 3 or 4 inches across and are carried on arching spikes, some of which have a branching habit. The flowers are set closely together and symmetrically on the spike, each carrying many flowers. Odontoglossums are generally white, white suffused pink or mauve, or beautifully spotted with brown, chocolate, red or crimson. Very fine yellows are also found which are often spotted or blotched. *Odontoglossum crispum*, from Colombia, and its numerous varieties takes pride of place, having large white flowers often suffused with a delicate rose shade and like most Odontoglossums a bright yellow or golden lip.

Odontoglossums are economical plants as far as space is concerned, since they do not occupy so much room on the staging and are not so tall growing as Cymbidiums. In a mixed house a good position is towards the front of the staging, overshadowed, one might say, by the larger Cymbidiums. Shading should be supplied by the end of February in exposed situations and by early March for houses that are more sheltered, for these orchids are quickly sensitive to sudden bursts of sunlight at this time of the year, after the long dull winter, and young growths are easily damaged. The plants must be treated individually according to their immediate requirements; water, for instance, should not be given indiscriminately. It will often be found that some plants dry out more quickly than others, especially those that are in smaller pots. These will, therefore, require watering more frequently than the plants in the larger pots. Watering will be required far less often during the winter months when the greatest danger of overwatering exists. During the winter allow the plants to dry out partially before deciding to give water. Always use rain-water or soft water, since that from the tap, unless one is fortunate enough to be in a district where the main supply is soft, is too hard, often being charged with lime which orchids dislike. At all times a perpetually sodden condition must be avoided.

Repotting

Odontoglossums and Odontiodas should be repotted every two or three years. The best time is during the spring as the plants then have the advantage of the lengthening days and the roots can get established into the new compost before the hot summer weather. Any repotting that has not been completed during this period is better deferred until September when the lower temperatures and the moist autumn nights give the plants time to get well established before the winter. Odontoglossums should be repotted when the compost, due to decay, requires renewing or when the leading pseudo-bulb has grown to the rim of the pot, for, like many other orchids, they grow forward and sufficient space for this forward growth must be provided at the front of the plant. Usually, when repotting the Odontoglossum, one or two only of the old back bulbs should be removed, provided sufficient bulbs, say four or five, are retained on the plants. The old decayed compost must also be removed from the rear of the plant without interfering with the front portion. It will then be found that the plant will probably go back into the same pot, with the rear of the plant placed firmly against the side of the pot. The space thus obtained at the front and sides of the leading pseudo-bulb is then filled in with fresh compost as explained in Chapter Three. If a back bulb has been taken off, this may be potted up as already explained, and will often produce a new young growth. A good compost for Odontoglossums will consist of 2 parts of finely cut osmunda fibre and 1 part of sphagnum moss, in which may be incorporated clean silver sand and rubbed dry oak leaves.

Temperatures and ventilation

Odontoglossums, although coming from tropical countries, are essentially cool growing orchids, for they grow at high altitudes with abundant moisture and a cool atmosphere. Therefore, during summer months the day temperature should be kept as near as possible to 60° F. to 65° which, of course, is not practicable on hot summer days. However, much can be done to keep conditions as cool as possible by increasing the shading and by using extra ventilation, providing plenty of fresh air, but not by leaving the greenhouse door open; this should never be done. Extra damping will also be required to maintain a humid atmosphere at all times. During summer months or on nights when the outside thermometer registers 50° or more the ventilators may be left partly open. The plants will benefit greatly from the additional fresh air. On other nights when there is a danger of the temperature dropping during the night or very early morning, it is not advisable to leave the ventilators open. During the winter months the night temperature should not be allowed to drop below 50° and efforts should be made to keep as near to this figure as possible. This is not always easy with severe weather outside, but at such times it is better to keep the plants on the drier side, and allow the temperature to drop a few degrees, but not below 45°. These plants resent too much fire heat which must only be regarded as an expedient made necessary by our climate.

The growing season is during the spring and summer months and with the approach of autumn more air and light may be given gradually to ripen the season's growth, with the object of encouraging the development of flower spikes. Damping must be continued to keep up the required moist conditions and, during the summer months, overhead spraying may be practised, allowing sufficient time for the foliage to dry out before nightfall.

Some Odontoglossum species

Apart from the many fine hybrids, there is the grand old favourite species *Odontoglossum grande* first discovered in 1839 in Guatemala, which is quite different from any other type of Odontoglossum. The pseudo-bulb is larger and more leathery as are the two leaves from the bulb; the green foliage is darker in colour and both foliage and bulbs are hardier and can, therefore, stand greater fluctuations of temperature than other species. This plant will produce three, four or five large handsome flowers, often 6 inches across, on a strong stem. The petals are bright yellow, heavily barred with chestnut brown, while the lip is a paler yellow. O. *grande* is sometimes known as the Clown Orchid, because of the formation in the centre of the flower resembling the figure of a clown, always a source of interest when pointed out to visitors. In addition the flowers have the appearance of having been varnished, giving a most pleasing effect. The treatment is a little different from that required by others, since the plant needs a decided rest during the winter months when water should only be given when the pseudo-bulb shows signs of shrivelling. The plant should be kept in the warmest spot in the cool house during its resting period, otherwise the culture is much the same as for other Odontoglossums. Another species requiring similar treatment is O. *citrosum*, a native of Mexico and a beautiful plant when in flower.

Another strong grower is O. *edwardii*, a native of Ecuador, again with larger pseudo-bulbs and leaves. This plant throws a long branched spike on which the flowers are numerous. They are small, about the size of a violet and similar in colour, being violet-purple and delightfully scented, and are produced during the spring months.

Another very pretty species is O. *rossii* var. *majus*. This may be grown in pans on the staging, raised on an inverted pot, or hung from the rafters. It is of dwarf habit and is among the hardiest of Odontoglossums. It may be grown in the coolest end of the house. The flowers are white, sometimes suffused with pale rose, or a mauve pastel shade barred with reddish-mauve. This orchid and O. *cervantesii* both come from Mexico and they require the same treatment. O. *cervantesii* is a neat orchid, flowering in the winter. It is very pretty and its blooms last for a long time. Unlike some other Odontoglossums it does not require a definite resting period, but the compost must not, however, be in a continually sodden state.

From Colombia we have O. *pescatorei:* another favourite species, the flowers of which, carried on a branched spike during early spring, remain perfect for a considerable period. They are marked with violet spots.

O. *gloriosum* is also from Colombia and is very similar to O. *crispum* in growth, but is very variable, the flowers of some plants being more scented than others. The petals are usually ivory white to pale yellow, and are well barred or spotted with rich chestnut brown.

All Odontoglossum blooms are long lasting and all hybrids as well as many of the species are extensively used as cut flowers, but when the spikes are to be cut for indoor decoration, it is advisable to allow the blooms to remain on the plants several days after being fully open, for after this time the flowers will have developed and become 'set', when it will be safe to cut them and they will last quite a long time in water. If taken off the plants too early the flowers are liable to wilt quickly.

Odontiodas

The advent of Odontiodas, which are garden-raised hybrids, produced by crossing an Odontoglossum with *Cochlioda noetzliana*, a native of Peru and Ecuador, allied to Odontoglossum, introduced an entirely new range of colours into this class of orchid. These embrace orange, red, crimson and scarlet shades, and were brought about by the influence of *Cochlioda noetzliana*, which has orange-scarlet flowers and is well worthy of a place in the collection.

There are today hundreds of different Odontiodas from many different parents. All are beautiful and to attempt to give a complete list of them would be futile. One need only visit any flower show where orchids are exhibited, particularly Chelsea Flower Show, or any orchid nursery to see and appreciate these lovely flowers.

Odontiodas require the same cultural treatment as Odontoglossums and are grown in the same house. Both are liable to attacks by thrips, especially during the height of summer and when excessive pipe heat is used during the winter months. These pests attack the young growths and flowers alike. However, where regular fumigation or nicotine spraying is practised at intervals of two or three weeks, paying particular attention to the undersides of the leaves, there is little likelihood of these insects gaining a hold.

Odontoglossums and Odontiodas present a very wide range as already stated and the following hybrids are only a few of the many available:

Odontoglossum hybrids

Odontoglossum Amabile (*crispum* Harryianum x *crispum*)
O. Aristocrat (Lambeauianum x Pegasus)
O. Berwick (Derwent x Bedelia)
O. *Crispum*
O. Isfield (Sertyus x *crispum*)
O. Palmyrus Queen (Purple Queen x St James)
O. Panther (*crispum* x *percultum*)
O. Patmina (Aristocrat x Lenore)
O. Princess Elizabeth (Faustina x *crispum*)

Odontioda hybrids

Odontioda Astoria (Odontioda Pittiae x *Odontoglossum crispum*)
O. Gladys (Odontioda Bradshawiae x *Odontoglossum pescatorei*)
O. Rosnant (Odontioda Peaseblossom x Odontioda Puck)
O. Zenobia (Odontioda Charlesworthii x *Odontoglossum percultum*)

DENDROBIUM

Including the numerous hybrids, this is a very large family. They are found growing naturally throughout the East, India, Burma, Assam, etc. Many of them are more suitable for the intermediate house, but there are a few that will succeed in the cool house and deserve to be represented in any collection. In general, the flowers are produced in clusters from the axils, while others, such as those of *Dendrobium thyrsiflorum*, are in drooping clusters, with a formation similar to that of a bunch of grapes.

The culture of these plants is not difficult. All Dendrobiums must be given as small a pot as possible and they require an abundant supply of water during the summer months. The potting compost may consist of 2 parts of osmunda fibre and 1 part of sphagnum moss, allowing ample crocks in the pot for swift drainage. The plants vary in height from a few inches to a few feet according to the species grown and it often happens that owing to the necessity of having to use such small pots a plant will become top heavy. This may be rectified by placing the pot in a slightly larger one and standing both on an inverted pot on the staging to allow extra circulation of air.

Dendrobiums take a decided rest in a temperature of approximately 50° F., after the season's growth has been completed. The formation of the terminal leaf at the apex of the elongated pseudo-bulb indicates the completion of the formation of the pseudo-bulb. At this stage watering will be gradually reduced and additional light may be allowed to assist in ripening the growth for the eventual production of flowers. During the winter months very little water will be required, only sufficient being given to prevent the pseudo-bulb from shrivelling. If too much water is applied during the winter resting period premature growths will sometimes appear from the tops or sides of the pseudo-bulbs at the expense of flowers. Where, however, these premature growths appear and are beginning to produce roots of their own, they may be removed and potted up into small pots and allowed to grow on. Any growths appearing from the base of the bulbs should be allowed to remain.

Repotting

The flowering period is in the spring and any repotting may be done after the plants have flowered, but this should only be necessary every two or three years, depending on the state of the compost and whether the plant has really outgrown its pot. Dendrobiums by their nature will often produce roots attaching themselves to the sides of the pot or simply meandering upon the surface of the compost. It will be noticed that as the roots grow in length they are preceded by a pale green growing tip, an indication that the plant is active and not at rest. As this green tip of the root extends it is followed by a whitish papery covering which acts as a protection for the roots and also helps in absorbing moisture contained in the atmosphere. It will be noted that the green tip of the root, in common with those of many other orchids, is extremely delicate and care should also be exercised to see that these ends do not get damaged. Should it be observed that the tips of these exposed roots are being eaten off, slugs or woodlice should be suspected and efforts must be made to destroy them.

Shading

The shading during the summer months for Dendrobiums does not require to be so heavy as for other cool growing orchids. They enjoy sub-tropical conditions, more light may be given to them and all shading should be completely removed by early autumn when they will appreciate the sunlight and a warm moist atmosphere such as is required throughout the summer. During the summer the plants may be syringed frequently, both overhead and beneath the foliage. This must, however, be discontinued as soon as the plant has completed its season's growth, when cooler conditions will prevail.

Some species

A good and always popular Dendrobium for the cool house is *D. nobile.* This is a spring flowering, free growing orchid with clusters of two or three blooms. The flowers are whitish, margined with rose-purple and with a heavily blotched lip of deep purple. This plant is a native of Assam.

Another species which may be grown in the cool house is *D. jamesianum,* a native of Burma, which produces trusses of fine white and yellow flowers. It requires plenty of water when in growth and to prevent the pseudo-bulbs becoming shrivelled the plant should not be allowed to become bone dry during the winter. The stems have black hairs and the plant flowers during spring or early summer.

A few other good species that may sometimes be included in the cool house are *D. crysanthemum, D. chrysotoxum, D. devonianum, D. thyrsiflorum, D. wardianum,* and many hybrids such as D. Ainsworthii, and D. Thwaitesiae.

ONCIDIUM

Oncidiums are extensively distributed in nature, the species being found throughout the West Indies and South America. Accordingly most of these orchids require warm house or intermediate house culture. There are, nevertheless, a few species which may be grown in the cool house, and their cultural requirements are much the same as those of the Odontoglossum. They are all beautiful and should be grown wherever possible. Perhaps the easiest of these Oncidiums is the variety *Oncidium varicosum rogersii* from Brazil. This is a lovely little orchid, often throwing up a flower spike 3 to 5 feet high, which becomes branched, sometimes in umbrella form, often carrying over fifty intensely bright yellow blooms which shimmer as the diffused sunlight passes over them. The fairy-like flowers are about the size of a florin with the lower labellum greatly enlarged, giving the impression of a little lady in a crinoline. Others see in this flower the mimicry of an insect; in fact *Oncidium papilio,* described on page 136, as the name implies, definitely resembles a butterfly.

In common with other Oncidiums, O. *varicosum rogersii* requires very little watering during the winter and should be definitely rested after flowering, usually after the autumn, at which time the flowers will last for quite a long while.

Other Oncidiums that may be included in the cool house are O. *marshallianum:* also from Brazil, flowering in early summer, the flowers being produced on long branching spikes, several feet long, emerging from the base of the pseudo-bulb. The flowers are large with bright yellow petals and brownish sepals, the lip being white tinged with purple. As can be imagined the strain placed upon this plant in producing such a large flower spike is considerable, and it is advisable to pinch out the flower spike every other year to keep up the strength of the plant.

O. *forbesii*, also from Brazil, is a fine orchid when well grown and has large flowers with broad segments, yellow with chestnut brown markings. It should be treated in the same was as O. *marshallianum* and grown at the warmest end of the cool house.

From Guatemala we have O. *ornithorhynchum*, requiring similar treatment as the previous two. This is a winter flowering plant and it carries its flowers on a spike 1 to 2 feet high. Although the flowers are small they are scented and are a delicate shade of rose-lilac, the spray being slightly arched.

O. *macranthum* is a fine strong grower and flowers over a long period when in a healthy condition. This spectacular orchid comes from Ecuador and it throws a flower spike several feet long. It is, therefore, advisable not to allow the spike to remain on the plant too long and treatment should be as for O. *marshallianum*, the plant being allowed to flower only in alternate years. The flower spike has short flowering stems from the main spike, which may be trained round sticks for support, or trained to wire attached to the roof. The flowers are a beautiful golden-yellow with brownish sepals, and a purple and white lip. This orchid should be kept in the warmest end of the cool house. It usually flowers early in the summer and attracts well-deserved attention.

O. *tigrinum* is another robust grower and has rather larger and more rounded pseudo-bulbs. This orchid should also be kept in the warmest spot and will succeed in the Odontoglossum house. The flowers are produced on branched flower spikes, 3 to 4 feet long, blooming in the autumn, often as late as October or November. The pleasantly fragrant flowers usually have a fine large spreading yellow lip with the petals marked with rich dark chestnut.

Miscellaneous other Oncidiums suitable for cool house culture are: O. *aureum*, O. *fallens*, O. *phaleanopsis* and O. *loxense*. Other Oncidiums of note and well worth growing but requiring warmer conditions are described in Chapter Ten.

CYPRIPEDIUM

With the Cypripediums (most of the greenhouse species of which are now placed by botanists in the genus Paphiopedilum) one has a wide choice of species and hybrids suitable for the cool house, and for this section of orchid culture only the green-leaved varieties or hybrids that have the *Cypripedium insigne* influence in them should be grown since the mottled-leaved cypripediums require more warmth and are not suitable for cool house treatment.

Unlike many orchids the Cypripedium, or Slipper Orchid as it is commonly known, has no pseudo-bulbs, but is furnished with thick fleshy roots. These roots are not produced plentifully as they are with the Cymbidium, therefore the plants must not be subjected to prolonged drought, for they have no pseudo-bulbs to act as storage and if water is withheld for any lengthy period the plants will suffer and fail to make progress. Therefore, as is usual with all orchids, when watering make sure that the whole of the compost is soaked throughout and is not allowed to get too dry before the next watering. During the summer months these plants will benefit from liberal spraying overhead, and on the undersides of the leaves, combined with a heavy moist atmosphere, but it is important that no water is allowed to remain overnight in the axils of the leaves for this will lead to the rotting of the tissues. During winter months far less watering will be required, partly because the compost takes longer to dry out, but sufficient water must be given to keep the compost just moist as Cypripediums do not take a decided rest as many other orchids do. Overhead spraying should not be carried out during the winter months, except on bright sunny days when a light spray may be given during the earlier part of the day to ensure the foliage being dry again before nightfall.

By the nature of their rooting system Cypripediums require a more retentive compost and a suitable preparation may consist of 2 parts of fibrous loam, 1 part of chopped sphagnum moss and 1 part of cut and pulled osmunda fibre. All this is evenly mixed together with some coarse silver sand and a sprinkling of hoof and horn meal, as for Cymbidiums. Ample drainage should be provided.

Repotting may be undertaken soon after the plants have finished flowering in the early spring, but only if necessary and where it is desired to divide the plant. When repotting care should be taken not to overpot a plant; use a pot which allows sufficient space for the plant to grow and at the same time 'sit' comfortably, after which repotting should not be required for another two or three years.

In common with other cool house orchids shading must be supplied and Cypripediums grow well in a low house where a good moist and shady atmosphere is provided for them during the spring, summer and early autumn.

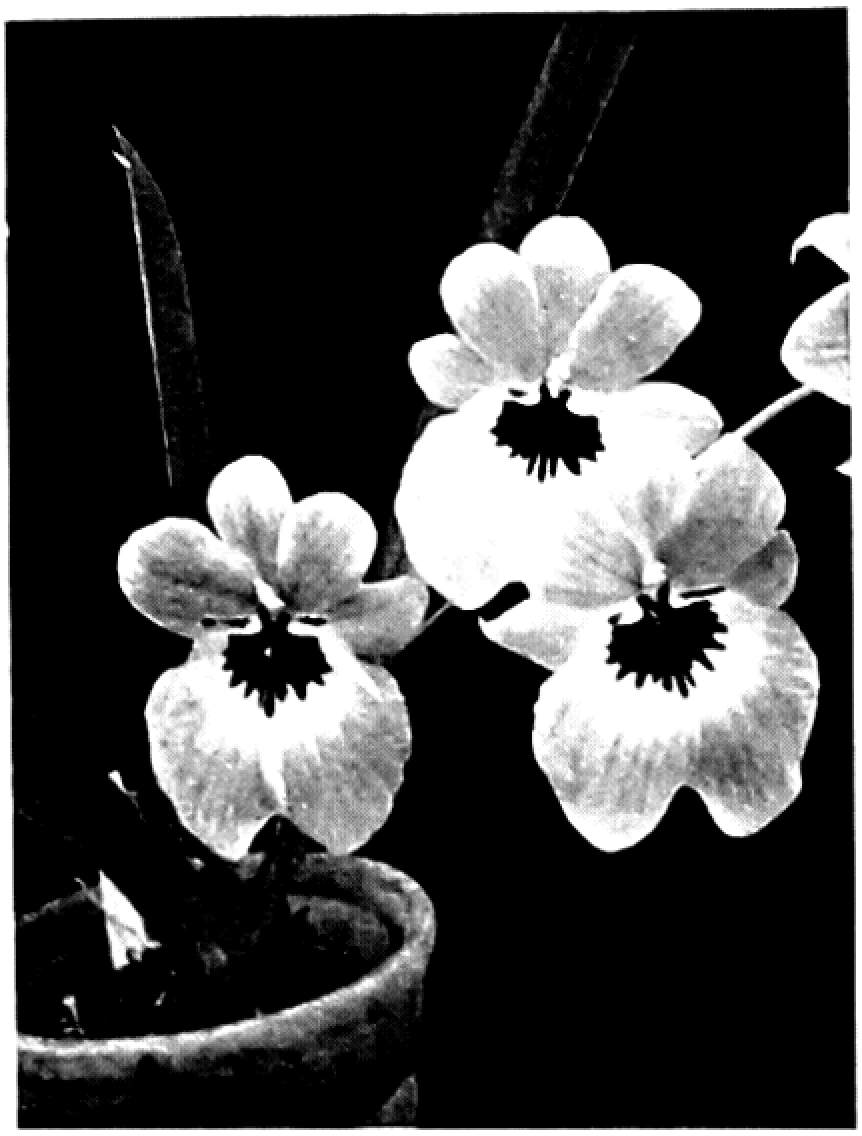
The flower of the Cypripedium is usually borne on a single stem from the centre of the growth, each stem supporting one large bloom, the lip of which is in the shape of a pouch, hence the name 'Slipper Orchid'. The dorsal sepal which is often heavily spotted is the main characteristic of the flower and the whole flower has a glazed or varnished appearance. Cypripedium flowers are among those orchid blooms notable for their long lasting qualities and they will last for several weeks on the plant. There is also a demand for the blooms as cut flowers, for which they are eminently suitable.

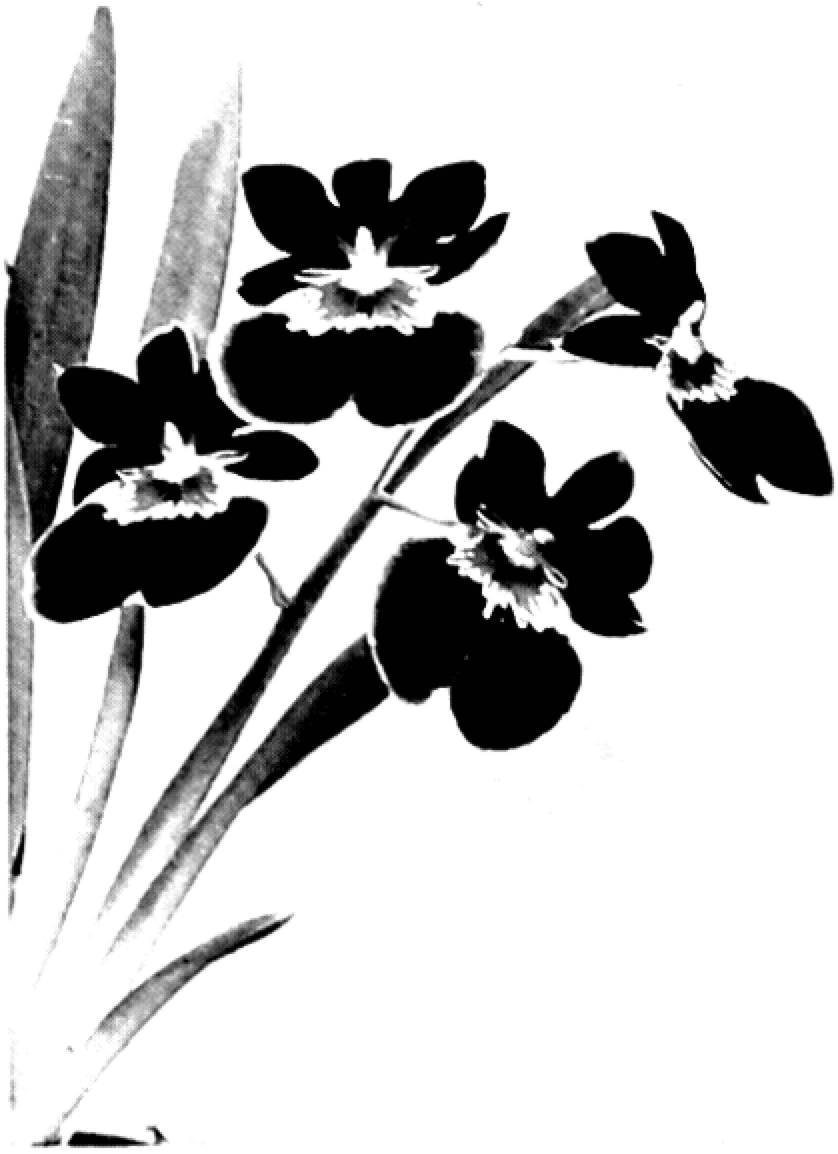
Cypripediums are very susceptible to draughts, which must be prevented, special attention being paid to ventilation to ensure that no current of cold air passes over the plants. Scale insects may become troublesome and should be kept under control with a nicotine insecticide, searching for them on the undersides of the leaves, especially at the base of the growths and on young flower stems and buds.

Perhaps the most popular and easily grown species with which one commences a collection of orchids is *Cypripedium insigne*, so often seen in the florist's window. This plant comes from Nepal and can be grown on into quite a specimen plant, eventually filling a 10- or 12-inch pot, when one may expect to obtain a good show of blooms. The flowers are best described as having the dorsal sepal greeny-yellow with brownish-purple spots on it, margined with white and a prominent similarly tinted pouch. There is a fine variety of *C. insigne* known as Harefield Hall and another *C. insigne sanderae*, which is a yellow form.

C. villosum, from Moulmein, is another easily grown species requiring the same treatment as *C. insigne*. The flowers are rich in colour, glossy in appearance, in shades of dark rich brown with a tinge of pale green and purple. This plant flowers in early spring.

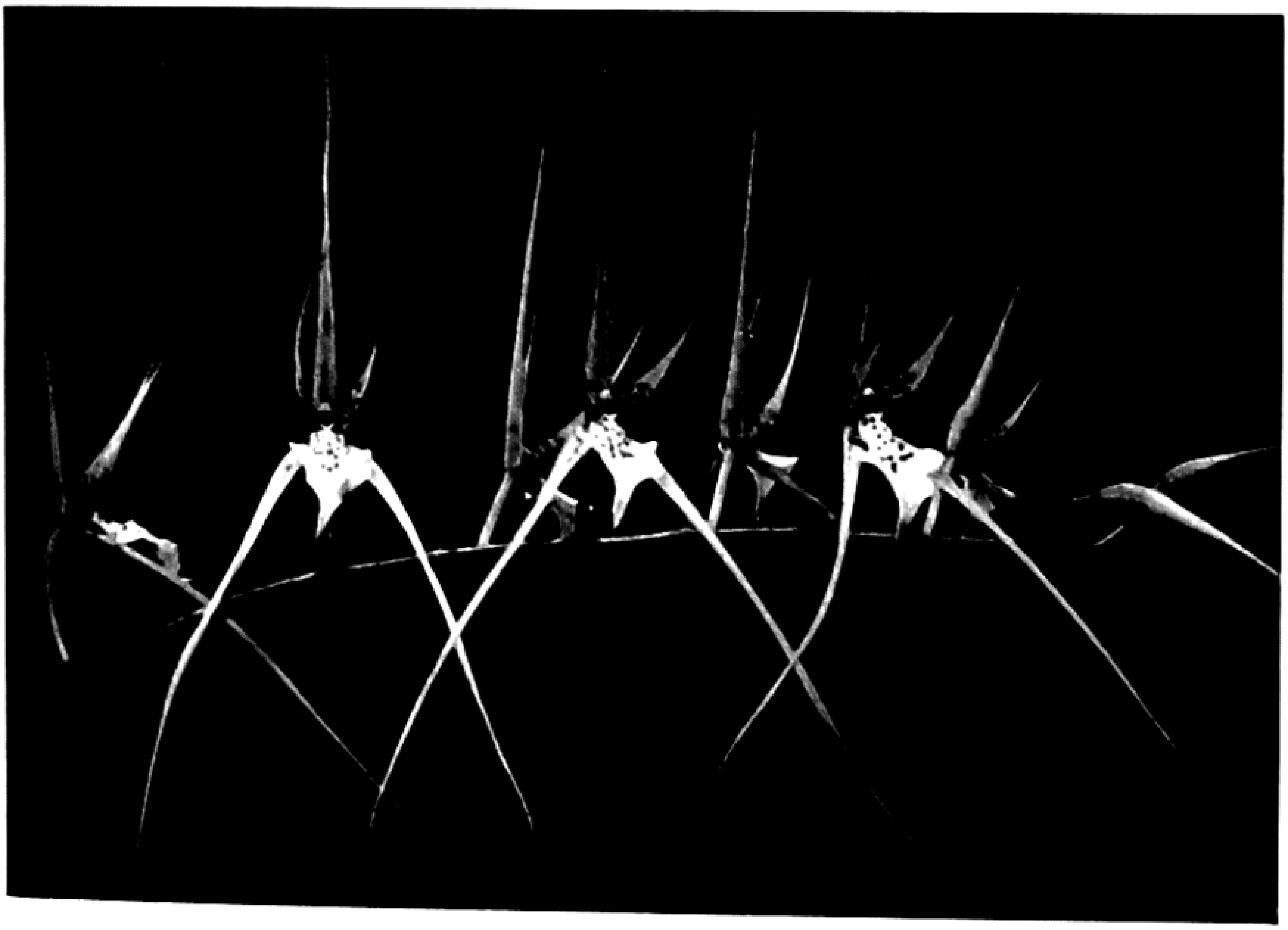
Then we have a really dainty little orchid in *C. fairieanum*, with neat strap-like foliage. The dorsal sepals are white-striped or veined with deep purple with reflexed petals and olive-green pouch. The flowers have a distinctly oriental appearance about them which is quite intriguing. This Cypripedium has been used extensively for the production of modern hybrids.



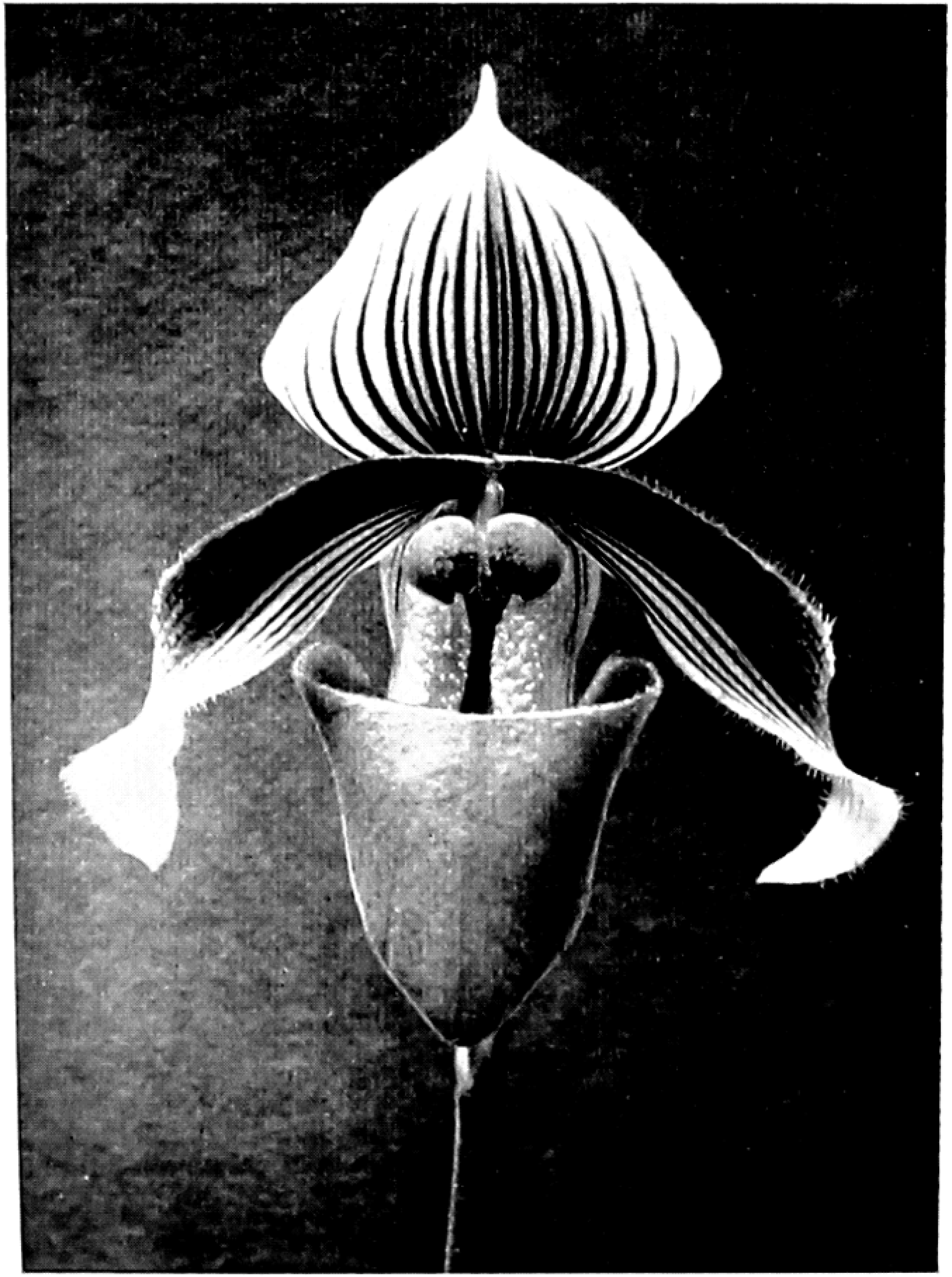


Left: Miltonia 'Nadia' is a delightful delicate pink with a maroon centre

Right: Miltonia 'Cardinal' is a dark, velvety crimson-pink with a lighter centre, a contrast to Miltonia 'Nadia'



Brassia brachiata (*the Spider Orchid*), *a cousin to* Brassia verrucosa



Above: A fine group of hybrid Cypripediums

Right: Cypripedium Curtisii var. Sanderae

C. hirsutissimum is remarkable for its extended and wing-like, hairy, twisted petals, adding considerably to the breadth of the flower which is often over 6 inches in width. The colour is dark olive-green, heavily stippled with dark purple as though the whole flower had been varnished. It is a desirable plant but does not take kindly to cultivation, deteriorating after a few years.

The foregoing are only a few of the many species that may be included in a collection and to which may be added such species as *C. parishii*, which will produce three to seven flowers with pale green striped, twisted petals about 5 inches long, on a scape 18 inches high.

Cypripedium hybrids are naturally far in advance of any of the species. Large strides are being made in getting the flowers to perfection and there are untold numbers of modern hybrids, often beyond description and all extremely beautiful. Modern hybrids command a high price since, apart from the hazards of growing the tiny plants over a period of years to the flowering stage, the seed pods formed by hybridizing often contain only a small number of fertile seeds and at times none at all. It is, therefore, a sound investment for the amateur to purchase young unflowered seedlings which require growing on for a season or two. When purchasing such plants mention should be made that they are required for the cool house.

A few suggestions of choice Cypripediums suitable for the cool house are:

C. Albion (white) (Astarte x *niveum*)
C. Blagrose (red) (Cardinal Mercier x Eurybiades)
C. Culmo (red) (Great Mogul x Cullum)
C. Dramatic (yellow/green) (Desire x Grace Darling)
C. Drayton (red) (Blagrose x Paterson)
C. F. C. Puddle (white) (Actaeus x Astarte)
C. Minster Lovell (yellow) (Grace Broughton x Lady Mona)
C. Moon of the Mist (Desdemona x nitens-Leeanum) as illustrated (page 131)
C. Red Hackle (red/brown) (Bladur x Lucid)
C. Rosy Dawn (white, flushed rose) (Astarte x Gwen Hannen)
C. Volcano (red/brown) (Edenbridge x Fire Girl) etc.

VANDA

Blue is a scarce colour in orchids and *Vanda caerulea*, a handsome plant, is perhaps the nearest approach, with its large, fine, sky-blue flowers, carried on stems from 1½ to 2 feet long, and for this reason alone it should be represented wherever possible. It is one of the three Vandas that may be grown in the cool house. It should be only lightly shaded, and if given full sun towards the end of the summer it will flower all the better in the autumn. Vandas are epiphytic orchids, growing throughout the warm countries of the East. The main stem is erect and woody with stiff, plicate, evergreen leaves. This orchid only makes two pairs of leaves each year, the ends of which look as though they had been nibbled by a mouse. It appreciates overhead spraying during hot weather. Thick fleshy aerial roots are produced and these should be encouraged to enter the compost. After a time the plant may become 'leggy' with many aerial roots from the main stem. If this happens it may be shortened by cutting off the top portion, being careful to retain some of the roots. This top portion may be potted up and kept sprayed and shaded for a few days.The bottom half may also be retained as it often produces new growth from the side.

V. kimballiana is a pretty little orchid, but quite unlike *V. caerulea.* It hails from Burma and is quite suitable for the cool house and need only be grown in sphagnum moss with a little fibre. The flowers are pure white suffused with rose or purple and the scapes are about a foot high.

V. amesiana has short stems carrying white, fragrant flowers with a lip of deep rose. It may be treated in the same way as *V. caerulea.*

COELOGYNE

The following are a few Coelogynes, mostly of quite easy culture, requiring cool house treatment. As the cultural details are the same as for Coelogynes requiring intermediate house treatment, reference should be made to the section relating to these plants on pages 136 and 137. The following are among the best and should be represented in any collection.

Coelogyne cristata, from Nepal, is one of the most popular of this range of orchids, as it is very beautiful and of easy culture. It is best grown in a pan. The flowers are pure white with a yellow throat to the labellum and are carried in short pendulous racemes. Plants that are in vigorous growth often have six or more flowers to each raceme. As advised on page 136 this plant should not be repotted unless absolutely necessary. When in full growth the plant can take considerable supplies of water, but when the season's growth is completed it should be rested in a drier position and watered very infrequently. If it is kept moderately dry it will withstand a drop in temperature to as low as 40° without harm.

C. cristata lemoniana, a lovely variety, requires the same treatment as *C. cristata*, from which it differs only in the colour on the lip, which is a pale lemon shade instead of yellow. It flowers during March.

C. barbata has erect spikes with flowers of pure white, the lip being bearded with brown hairs. It usually flowers during the winter.

C. mooreana is another very desirable orchid which is better grown in pots on the staging. The flowers are carried on erect spikes about a foot high and in common with others of the same family they are pure white with a yellow or golden throat. In contrast with *C. cristata* which has numerous small roundish bulbs, this plant has fewer but larger bulbs.

Other Coelogynes requiring cool house treatment are: *C. fimbriata, C. mossiae, C. ocellata,* and *C. ochracea.*

EPIDENDRUM

The Epidendrums are one of the largest genera. They are comparatively easy to cultivate and are free-flowering, the flowers ranging from the miniature of 1 inch to as much as 5 inches across, many of which are delightfully scented, and for this reason alone are well worth growing. Many are of botanical interest only.

These orchids originate from the wilds of tropical America and are more or less continuous throughout central America, Mexico and the West Indies, etc. Under greenhouse culture many will succeed in cool house conditions whereas others do well in the intermediate section. The following is a good selection for any amateur:

Epidendrum vitallinum is a native of high altitudes in Mexico where the atmosphere is heavily charged with moisture and cooler conditions prevail. The flowers are a brilliant orange-scarlet colour and last for a long time. On established plants often twenty blooms are carried on a spray. This species is best grown in a pot in the Odontoglossum house and requires the same treatment as the Odontoglossums, but it may be placed at the coolest end of the house where it should flower from May to August. The best time to repot, when it becomes necessary, is in March, although the plants must not be allowed to dry out afterwards or the flower spikes, which begin to appear about this time, may suffer. It should, however, be kept on the dry side during the winter months.

E. atropurpureum is a tall grower, capable of carrying eight to ten flowers 3 inches across, and one of the loveliest of the genus. The flowers are yellowish-green and reddish-brown, the large lip being white with crimson stripes. It is also from Mexico and Venezuela.

E. ciliare: a well-known orchid, in appearance similar to a Cattleya, carrying graceful yellowish-green, white-lipped flowers in clusters. It grows freely in Mexico.

E. fragrans bears creamy-coloured flowers with purple striped lips on short erect scapes. The flowers are produced during the summer and are delicately scented. It occurs from Guatemala and throughout the West Indies.

E. prismatocarpum: another showy species of easy culture; the pale yellowish petals being spotted with purplish-black. The flowering period is during the summer. This species comes from central America.

E. radiatum is very similar to *E. fragrans.*

E. radicans, a semi-climbing orchid with stems often over 5 feet long from which aerial roots are produced. If the plant is grown against a wall these roots will attach themselves to the wall so this species may be treated as a climber. It is suitable for either the cool or intermediate house. The flowers are in clusters, bright red, and appear during the late spring and summer months and are very long lasting.

E. erectum, a well-marked and evergreen species and a very free flowerer. The blooms, which have long, pale red pedicels, last for a long time in perfection. It flourishes at the warm end of the cool house.

E. obrienianum is a cross between *E. erectum* and *E. radicans* and carries clusters of insect-like carmine flowers with an orange crest. In habit it is much like *E. radicans.*

BRASSIA

There are two species of Brassia well worthy of their place in a cool house collection. They require similar treatment to the cool growing Oncidiums, which they resemble in growth, although the flowers are entirely different.

B. verrucosa is a desirable and interesting orchid, which has flower spikes sometimes 2 feet long. The flowers are of a greenish shade with blotches of purple.

B. brachiata is a slightly larger plant with very similar flowers to those described above. Neither of these plants should be given a definite rest as they are nearly always active, and have no dormant period. Water should be given in moderation during the winter months. One other cool growing species is *B. elegantula.* Others requiring more warmth are described on page 136.

COCHLIODA

Cochliodas are all cool growing orchids and are grown in company with Odontoglossums to which they are allied and with which they share the same treatment. The flowering period is during the winter and spring. These orchids are natives of Ecuador and Peru.

C. noezliana has a dwarf habit and rich orange-scarlet flowers. This plant is well known as it has been used extensively in the production of hybrids, being crossed with Odontoglossums to produce the bigeneric hybrids, Odontiodas, and to introduce into them the bright colouring of this flower.

C. rosea, from Peru, has flowers rosy-carmine with a white column during winter and spring.

C. sanguinea bears pinkish-rose flowers with a paler lip during the autumn.

C. vulcanica, which blooms in the spring, has upright spikes with a darker shade of rose-coloured flowers and a paler lip.

LAELIA

Many of the Laelia species may be well accommodated in the cool house and a selection of these pretty orchids should be included where the temperature is kept to a minimum of 50°. Laelias are natives of Brazil and Mexico and require a decided rest after flowering. These orchids may be grown in pots on the staging or suspended from the roof. A suitable compost as advised for Cattleyas is recommended and any repotting should be done during March. After repotting keep the compost just moist and not too wet for about six weeks, after which the plants may be watered freely until growth is finished in the autumn. Then watering must be reduced, but not to the extent that the plants suffer from dryness, until they have completed flowering, after which only enough water is given to prevent shrivelling, until March. A small portion of the roof of the house should be left unshaded, but not to the detriment of other plants, so that the Laelias may have the benefit of full sunlight and plenty of air to encourage them to flower more freely.

Laelia anceps with its tall spikes of rosy-lilac flowers is perhaps the most popular of the species. Many named varieties of this species may be purchased. The lips are usually dark crimson while others have white segments. The plant is a native of Mexico and is easily cultivated, the flowers being produced during November or December. It should be kept at the warmest end of the house.

L. autumnalis, also from Mexico, is a pretty, easily grown species. The rosy-purple flowers are usually produced during the autumn.

L. flava is also suitable for the cool house. It has canary-coloured flowers during the summer.

L. jongheana has short bulbs but the flowers, produced in the autumn, are large and are rosy-purple with a darker lip.

L. pumila is of dwarf habit and also has large rosy-purple flowers with a darker lip, produced in the autumn.

MASDEVALLIA

Masdevallias, of which there are a great many species, natives of South America, are cool growing orchids. The majority are of botanical interest only, being compact and dwarf in growth. Very few merit growing for their beauty, although all are interesting and the plants grow well if potted in a compost of osmunda fibre and sphagnum moss. They may be grown suspended from the roof or in pots on the staging. Having no pseudo-bulbs they must be kept moist throughout the year.

Masdevallia chimaera has large flowers in variable shades of yellow, heavily spotted with reddish-purple, produced during the spring or summer.

M. harryana, from Colombia, a very variable plant of dwarf habit, has rich blood red flowers, produced in the spring. The variety *caerulescens* which also flowers in the spring, has larger flowers even more rich and brilliant.

M. ignea has the same habit as *harryana* and also comes from Colombia. The flowers are a fine bright fiery red, and are not so variable, being slightly between orange-red and bright red. The plants bloom in the spring.

M. veitchiana, a native of Peru, is a showy species with bright yellow or vermilion flowers shaded with purple. This plant has the habit of producing its flower spikes as soon as the new growth is completed which prolongs its flowering period. The variety *grandiflora* has larger flowers, brilliant orange-scarlet in colour, with purple veins, the blooms remaining perfect for several weeks.

M. shuttleworthii from Colombia is a pretty little species which should be grown in pans suspended from the roof. The flowers are rosy and greenish-yellow spotted with dark red.

M. polysticta has white flowers spotted with purple, which are produced in the spring.

M. schroderiana produces handsome flowers, white and rosy-purple, with long yellow tails in the summer.

M. xchelsonii, which flowers during the winter, is a free flowering garden hybrid between *M. veitchiana* and *M. amabilis*.

PLEIONE

These differ from the Coelogynes in that their bulbs are of annual duration only and, therefore, require different cultural treatment. The most popular of this genus is *Pleione lagenaria*, commonly known as the Indian Crocus. This species comes from the Khassia Hills, Assam, and it is a beautiful little orchid. Since the roundish pseudo-bulbs remain for one year only, there are no old pseudo-bulbs left as with other orchids, for by the time the new pseudo-bulbs are matured by about September, the old bulbs have become exhausted. At this time these lose their leaves and from the base of the bulbs the flowers commence to push their way through, opening in about November.

As soon as the plants have finished flowering they can be repotted into a fresh compost of fibre, moss and loam with an addition of sand. The pans should be filled with ample drainage to ¾ of their depth, and the compost brought level with the rim of the pan. Into this compost the bulbs should be inserted, about ten or twelve into a 6-inch pan, evenly spaced out and secured in position by small pegs. After this sphagnum moss is used to cover the surface between the bulbs to about half way up the sides of the bulbs. Only sufficient water will then be required to keep the moss moist until the leaves are developing when more water may be given until all growth is completed. The best position is near the glass where the plant can get plenty of light and as the bulbs mature and lose their leaves, watering must be less frequent. The flowers of this species are rose-lilac with a white lip marked with crimson.

P. humilis is also winter flowering and has blooms 2 or 3 inches across, bluish-white with a purple-spotted lip.

P. maculata from Assam is a fine companion for the others and requires similar treatment but should be kept a little more shaded. It flowers during the autumn, the sepals and petals being pure white and the lip marked with crimson.

P. praecox is an early winter flowering species with rose-purple flowers 3 inches across.

MAXILLARIA

The two Maxillarias described below will succeed in a compost of equal parts of osmunda fibre and sphagnum moss and should otherwise be treated in the same way as Odontoglossums. It is advisable to allow them to grow into specimen plants, keeping them in the warmest part of the house during the winter. They are of easy culture.

M. grandiflora, from Ecuador, is a pretty orchid, the scented flowers being large with milky white petals and a golden lip marked with crimson. This orchid blooms in the spring. The big pseudo-bulbs have large plicate leaves.

M. venusta from South America is sweetly scented, the flowers being white and yellow. It flowers during the autumn months and is suitable as a cut flower or for buttonholes.

LYCASTE

The Lycastes form a small but important genus of terrestrial and epiphytic orchids, of easy culture, requiring a compost of fibrous loam with a little sphagnum moss and finely pounded potsherds. Ample drainage should be provided. Treatment is the same as that required for Odontoglossums.

Lycaste skinneri, a native of Guatemala, is a very popular winter flowering orchid which bears large light rose flowers with darker petals, the thick waxy lip being whitish spotted with crimson. The plant has ovoid pseudo-bulbs bearing plicate leaves and the flower stems emerge from the base of the bulb. Any repotting may be done in the spring, but this should not be necessary except every two or three years. Special care must be taken in the culture of this orchid, not to overwater; it is much safer to give too little water even during the growing period and a sodden compost must not be allowed even during the summer.

L. deppei is a species from Mexico which may be treated in the same way as *L. skinneri*, but should be given a good rest before the plant flowers in the spring and kept in a light airy position to induce greater freedom of flowering. The blooms have greenish yellow sepals with white petals and a yellow lip. Mention must also be made of *L. aromatica*, a plant of dwarf habit, which also flowers in the spring, bearing a quantity of fragrant golden-yellow flowers, as also does *L. cruenta*.

MILTONIA

These are epiphytics often referred to as the pansy-like orchid. The species originated from Colombia and Brazil and there are numerous splendid hybrids. They are, for the purpose of this book, included in the intermediate section as the culture seems to overlap between cool house conditions and those appertaining to the intermediate section.

Throughout the summer months they may be accommodated in the cool house, say with Odontoglossums, and treated likewise, being moved into the coolest end of the intermediate section for the winter. Thus the plants benefit by the few extra degrees of warmth just when they need it during the longer winter nights. However, for the amateur who has not the advantage of other than a cool house, a warm spot away from draughts in such a house may often be available and used to advantage.

Miltonias succeed best where the night winter temperature does not fall below 55°F.

ZYGOPETALUM

This is a large epiphytic genus from Central America but only a very few are worthy of being represented in a collection, the chief of these being *Zygopetalum mackayi intermedium* which is a native of Brazil and is a winter flowering species, usually making a good display about Christmas time. It produces spikes about 18 inches high, bearing six or more flowers with sepals and petals of a greenish shade spotted with chocolate brown. The lip is white and is veined with bluish lines or spotted purple. Any repotting should be undertaken during March, allowing ample crocks for drainage, the strong thick fleshy roots delighting in a compost of fibrous loam, osmunda fibre and sphagnum moss. It is a good plan to place a portion of moss or old oak leaves over the crocks to prevent any of the loamy compost seeping between the crocks and choking the drainage. When repotting the completed surface should be ½ inch below the rim of the pot to allow for watering and as with all orchids the compost must not be allowed to remain in a sodden condition.

Z. crinitum has bulbs about 3 inches high and leaves averaging 18 inches long. The flowers are green and brown with a densely hairy white lip streaked with violet.

Z. maxillare has green blotched flowers, barred chocolate brown with a violet-blue lip, and a darker fleshy crest. This orchid blooms at various times.

CATTLEYA CITRINA

The only Cattleya suitable for the cool house is *C. citrina*. This is a charming little orchid from Mexico and it is a distinct departure from the usual Cattleyas which require warmer conditions, being quite different in habits and appearance. The pseudo-bulbs are roundish with a silvery covering and may be grown on blocks or in small pots hung near the glass. The bulbs face downwards and the flower which also hangs down is a delightful bright yellow, of thick waxy texture, deliciously lemon scented and is always a great attraction. There is one drawback with this orchid; it does not take kindly to cultivation, and after flowering once or twice gradually deteriorates in about the third year. It is, however, well worth growing and renewing the stock from time to time.

THUNIA

This genus consists of only a comparatively few species of tall, deciduous plants from Burma and northern India suitable for the cool house where a winter treatment should be given to the hybrids.

These orchids have a decided period of rest which occurs after the plants have discarded their foliage during the autumn. The flowering period of the Cattleya-like flowers being early summer, produced from the apex of the tall elongated stems. Although the blooms are not of long duration they are usually produced in succession and are of a delicate texture, therefore water must not be allowed to come in contact with the flowers which readily damp off. While the plants are at rest very little, if any, watering is required. New growths from the base appear early in the spring, and no water should be given until the young growths are about 3 inches tall, and then applied moderately: these young growths are tender and rapidly damp off if water is applied too liberally. As soon as the new root system is evident the plants may be repotted, which for Thunias is an annual event. I give these orchids a comparatively rich compost which contains a moderate percentage of dried and crushed cow manure, surfacing the top of the compost with a mixture of sphagnum moss and osmunda fibre only.

T. alba, a white species originating from Nepal.

T. bensoniae, has purple flowers fringed with yellow and comes from the neighbourhood of Rangoon.

T. brymeriana, from upper Burma, is a beautiful species, sepals and petals are white with radiations of purple on the lip.

T. marshalliana, also from Burma, similar to *T. alba* with a shorter lip, fringed light orange.

T. winniana, similar to *T. bensoniae*, with larger flowers, the sepals and petals being rose-magenta.

T. gattonensis, a hybrid between *T. marjorensis x winniana*; slightly variable.

T. veitchiana, a hybrid between *T. bensoniae x marshalliana*; slightly variable.

3. THE INTERMEDIATE HOUSE

CHAPTER EIGHT

Cultivation

THE CULTURE of those orchids requiring intermediate greenhouse conditions is in principle the same as that which is needed for the other sections, with certain exceptions and modifications of their routine requirements; ventilation, shading, watering, atmospheric conditions and heating being adapted for the different genera.

Orchids that grow by nature under sub-tropical conditions and which thus require that extra warmth are the usual inmates of the intermediate house and they require a minimum nightly temperature of 55° F., or rarely as low as 50°.

In considering the question of ventilation, the importance of fresh air cannot be over-emphasized, and it should be given on all possible occasions. Unfortunately there will be many days and nights, especially during the winter months, when this will not be possible for the intermediate section and ventilation during such months should never be given to such an extent as to lower the temperature. At these times the ventilators should be opened only for an inch or two for short periods, just enough to freshen up the air. During the summer months more air may, of course, be given, but always taking the immediate weather into consideration, and on the leeward side of the house, without fear of losing the moist atmospheric conditions too rapidly.

Damping down, owing to the generally warmer conditions, will be more frequent than in the cool house and should be done twice a day during the winter months, combined with what ventilation is possible, taking full advantage of any bright periods. During the spring more air can be given and damping increased accordingly. During summer and autumn months damping will be further increased and overhead spraying may be carried out to advantage, discontinuing this at the end of the autumn and gradually regulating the daily damping according to the amount of fire heat now in use.

Shading will not be so heavy as for the cool house and may be placed in position a little later in the morning, and removed in the latter part of the day where roller blinds are in use. But where a permanent shading is used, this may be gradually reduced earlier in the autumn, admitting more light and air to the plants.

Watering will also require the same considerations as recommended for the cool house orchids, special attention being paid to those plants suspended from the roof, but the watering must never be overdone or the roots of the plants will suffer and may die, apart from the danger of more rapid decomposition of the compost.

Heating is, perhaps, the subject requiring more attention, as fires, or whatever heating system is installed, will need to be brought into use much earlier in the late autumn and continued until later in the spring until climatic conditions make it safe for artificial heating to be discontinued.

The temperatures for the intermediate house are set out below, and are only intended as a guide to what is required, for fluctuations are bound to occur owing to the unavoidable variations due to weather conditions. Where these occur one's own judgment should be exercised.

AVERAGE INTERMEDIATE HOUSE TEMPERATURES

	Sunny days	*Dull days*	*Night time*	*Mornings*
Spring	about 75°	65°–70°	55°–60°	55°–60°
Summer	80°–85°	about 75°	60°–65°	about 60°
Autumn	75°–80°	65°	about 60°	55°–60°
Winter	65°–70°	about 60°	minimum 55°	minimum 55°

Where these temperatures can be maintained many orchids may be grown which cannot be grown in the cool house and the collection may be augmented by many extremely beautiful species and hybrids, pride of place being probably occupied by the Cattleya family and its very many allied hydrids, together with Brassocattleyas, mottled-leaved Cypripediums, Denbrobiums, Laelias, Laeliocattleyas, Oncidiums, Miltonias, and Vandas, all in variety.

CHAPTER NINE

Intermediate House Monthly Notes

January

DURING COLD weather very little ventilation will be possible, but a close stuffy atmosphere should be avoided by giving gentle ventilation whenever opportunity arises. Temperatures must be kept up and damping regulated according to the amount of fire heat used; once or twice during the day it is usually necessary. On mild days the temperature will rise a few degrees, but it is during the night-time that the minimum of 55° should be adhered to. Careful watering will be the order of the day as root action of many of the plants will have ceased or the roots will only just be on the move. No overhead spraying of the plants will be required except on an exceptionally bright day, when a light spray may be given during the earlier part of the day. During this month many plants will be at rest and will require little attention. Thrips are likely to make their appearance and preventive measures should be taken.

February

Conditions are much the same as for January, but they will improve towards the end of the month when the repotting season may shortly be anticipated. In preparation for this it is advisable to prepare a supply of compost. The days are gradually getting longer and the sun gaining in strength, consequently damping down will not be less than twice a day unless the weather turns dull, as it often does towards the end of this month. The ventilation required will be much the same as in January, increasing it on favourable opportunities. Cold winds at night will call for more warmth in the pipes and a bright fire should be kept in during the evening, shutting the boiler dampers last thing at night, once the pipes are comfortably warm. Shading will not yet be required.

March

Damping will now be required two or three times a day and ventilation continued as often as possible, being careful always to give air from the leeward side of the house. During March cold winds often prevail and at such times no ventilation may be possible and it is these penetrating cold winds that call for continued attention to fire heat, especially during the night when the required minimum temperature must be maintained. The temperature may rise during the day-time with the brighter periods and longer days to about 70° F. Blinds may be brought into use on bright days and removed during the early afternoon before the sun passes away from the house, to conserve as much warmth as possible in the evening. Laelias may be repotted towards the end of the month together with others that are showing signs of activity.

April

If a spell of fine warm weather occurs, fire heat during the daytime may be dispensed with, the temperature inside the house rising naturally and making shading necessary for a few hours each day. After such bright sunny days there is a danger of night frost so that the pipes should be warmed up at the end of the day or other forms of heating brought into use to keep the thermometer at the minimum of 55° F., maintaining sufficient moisture in the atmosphere by regular dampings, two or three times a day. Ventilation should be given during the daytime, closing the house down as the sun passes away from the house. Watering may be more frequent for plants that are active and only in moderation for those that have little root action. Repotting of those Cattleyas and other plants that are just beginning to show new young root action and the leading growths of which have reached the rim of the pot should be carried out without delay, thus avoiding possible damage to the tender new roots.

May

Examine the plants daily and give a good watering to those that are in need of it, passing over those about which there is a doubt. These are better left for another day or two, especially large old Cattleya plants, etc. Dampings during this month will be more frequent to maintain the moist atmosphere necessary, going round with the hose or watering-can and thoroughly wetting all parts of the house, below the stagings and between the pots. Overhead spraying with clean soft water or rain-water may be carried out, especially in hot dry weather during the day with the temperature standing at about 80°F. and at night when it is not below 65° and when night air can be given when possible. The ventilation should be increased during the daytime and reduced before the sun leaves the house, thus conserving the warmth until late in the evening, when fire heat may still be needed, especially if the nights turn cold.

June

All orchids will now be in full growth and every encouragement must be given to the plants to make rapid progress. They will require liberal waterings and the ample moisture needed in the air can easily be provided by more frequent dampings, combined with ample ventilation to ensure sufficient fresh air. Overhead spraying will also greatly assist the plants, but this must not be done too late in the day for all foliage must be dry overnight. Fire heat at night during this month will probably not be needed at all and the giving of night air may be continued, weather permitting. By the end of this month all potting must be completed.

July

Treatment is largely a repetition of that for June. Damping down will be necessary at least three times a day and many plants will be completing their growth. Watering of the plants will continue and overhead spraying carried out earlier in the day. A lookout should be kept for signs of thrips and preventive measures taken. Shading will still be kept in position.

August

Damping down should be continued as usual, but the nights will be a little cooler, therefore the last damping may be done a little earlier in the day and any overhead spraying should cease earlier. Ventilation is still important and a fresh moist atmosphere must be maintained. Shading will continue to be used and a little night air may be left on. During this month many plants will have finished making up their pseudo-bulbs, and water should still be freely given to such plants, but the plants should be given more light and air, placing them in the cooler end of the house and gradually reducing the waterings which must not be stopped too early as there is a danger of the pseudo-bulbs shrivelling. At the same time frequent waterings must not be continued for too long, otherwise the plants may commence to make a second growth, which must be avoided as these second growths rarely reach maturity until after the late autumn.

September

Less shading will now be required and where permanent shading is in use, this may be gradually reduced. The days are now beginning to draw in, nights are longer and the temperature should be kept to 60° or so at night, with an average reading of 70°–75° by day. Continue to damp down, giving the final damping not too late in the afternoon and use discretion in overhead spraying, so that no water is left on the plants over night. Fire heat will now be required to keep up the necessary temperature at night. Any plants that are backward should be placed at the warmest end of the house to help them on, while those that have completed their growth should be kept at the coolest end of the house and given more air and light to ripen and strengthen the season's growths.

October

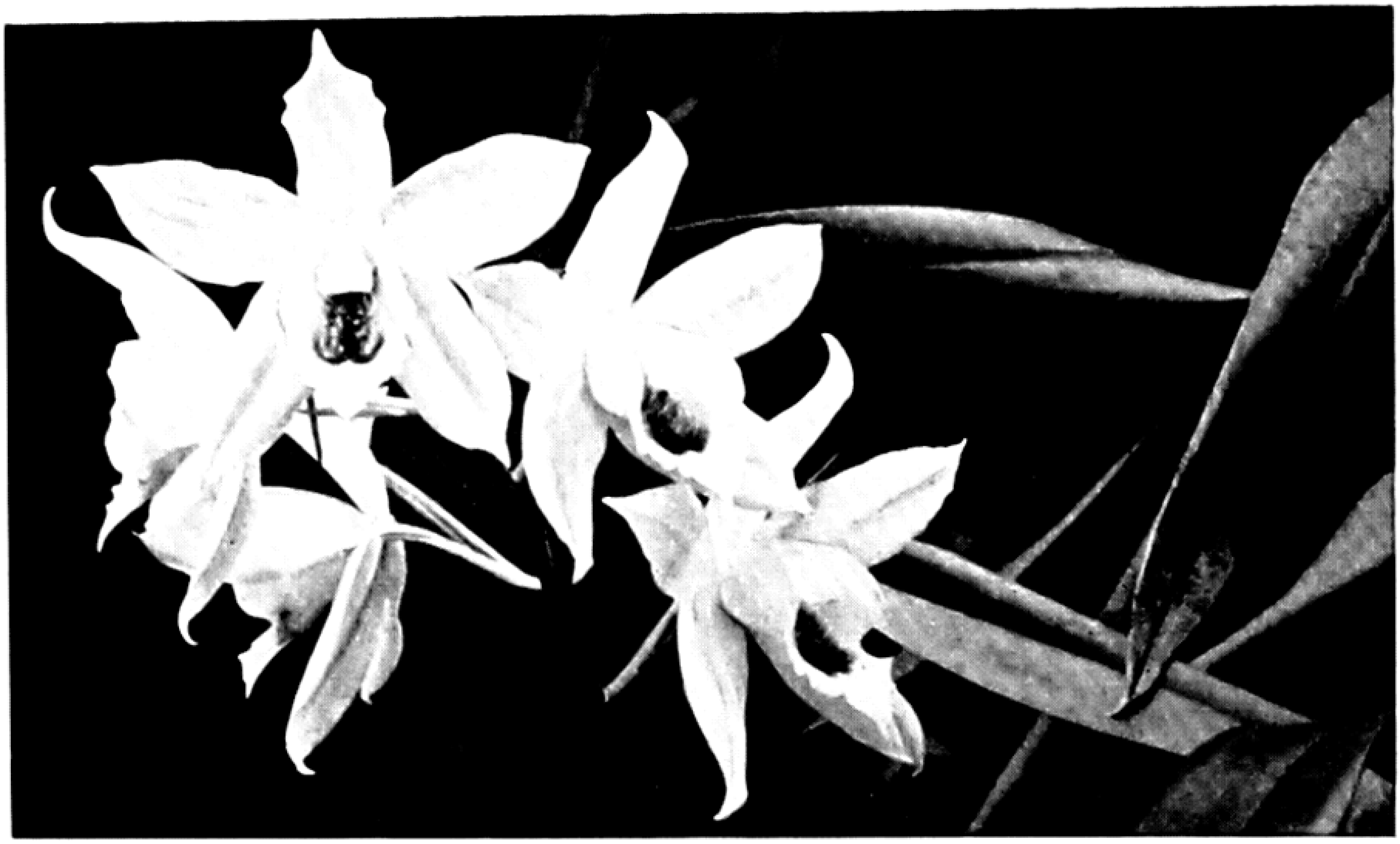
From now on watering will require great care but the plants should not be allowed to get dry at the roots. Shading may be dispensed with altogether and the glass of the house cleaned. Damping down may be done about twice a day and overhead spraying discontinued. Air should be admitted as much as possible during the day-time, closing the house down in the afternoon and regulating the temperature with fire heat from now on. Maintain a temperature of 60° by night and 65° to 70° by day.

November

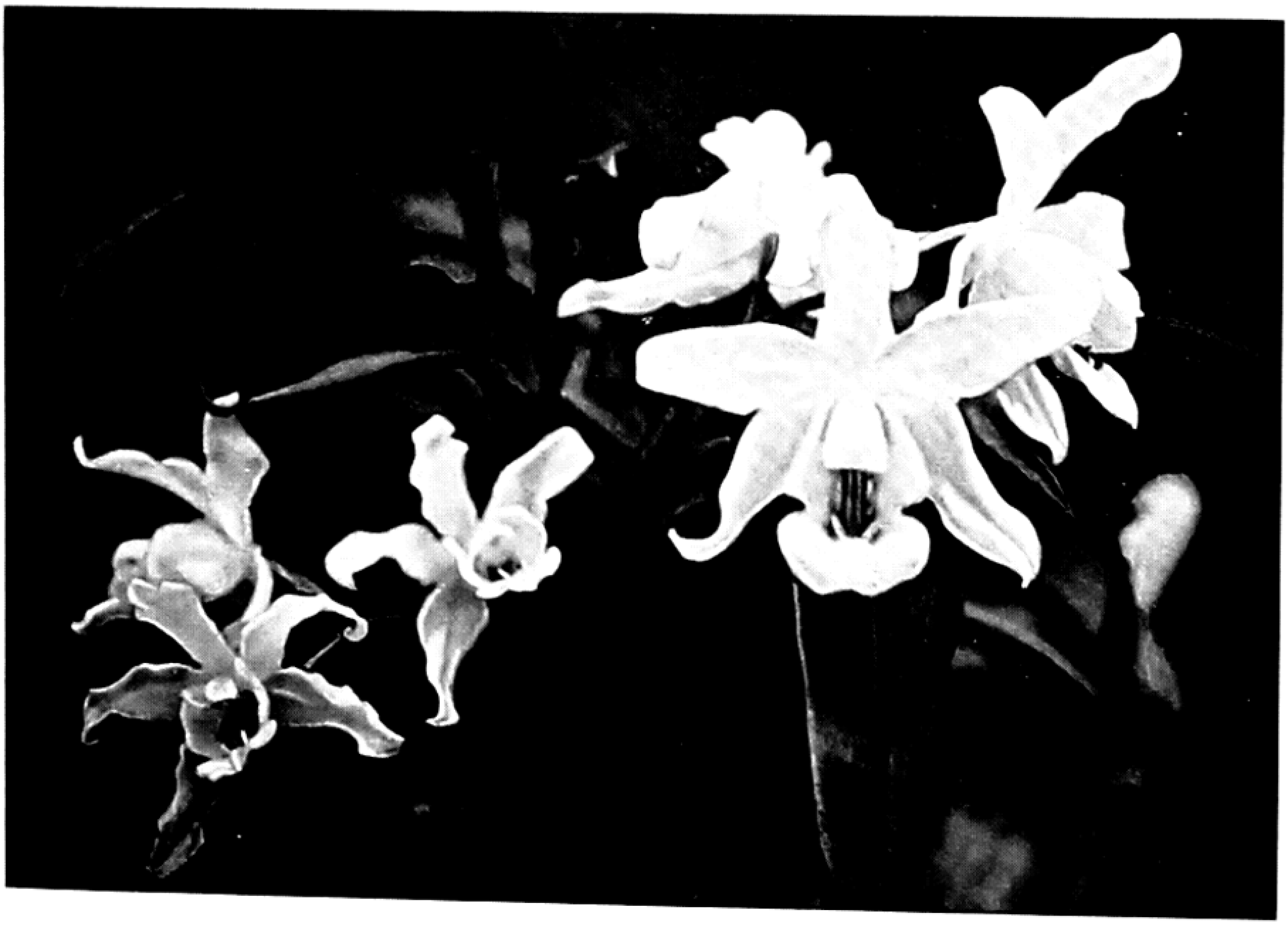
More fire heat will now be necessary. This entails careful attention to atmospheric conditions for humid weather may be expected at this time of the year and the pipes should be kept just warm enough to allow for steady ventilation during the day, night ventilation rarely being possible. Correct temperatures, much the same as for October, should be kept up, but should the weather turn cold and frosty very little ventilation can be given and extra pipe heat will be required. This entails more warmth in the pipes and an extra damping down. Fogs may also be expected and during these it is better to keep the house closed down to prevent the fog from getting into the house, keeping inside conditions quiet without any damping down. Watering of the plants should also be suspended until the fog clears when the glass should be washed down, for the plants will now require all the light they can obtain.

December

Continue to keep to a steady temperature with a minimum of 55° at night and between 60° and 65° by day, damping down at least once a day, sometimes twice if the day is bright or the house has a tendency to dry out too quickly. Some plants may still be a little active so do not attempt to force these by giving additional heat. Watering will require consideration and forethought, for with the possibilities of unexpected falls in the temperature the danger of overwatering is greater.



Coelogyne mooreana



Coelogyne cristata

Left: Cattleya citrina

Below: Cattleya labiata

CHAPTER TEN

Intermediate House Orchids

CATTLEYA

IT SEEMS appropriate to commence the description of orchids for the intermediate house with Cattleya species and hybrids, for they are all extremely beautiful, and even the best written description fails to do these fine flowers justice.

Many may be grown in teak baskets suspended from the roof of the house, but they may all be just as successfully cultivated in pots on the staging which seems to be the general rule today.

Cattleya blooms are mainly distinguished by their two fine large petals and three smaller ones, the lip of the flower being greatly developed and often beautifully fringed. The flowers are generally rose or lilac in colour with the lip darker and in greater variation. Of all the Cattleyas those of the labiata section are probably the most popular and all have handsome flowers. Examples of this section are *Cattleya labiata, C. lawrenceana: C. schroderae: C. mossiae:* and *C. dowiana*

Cattleyas have elongated, club-shaped pseudo-bulbs, from the terminal of which there is one large thick leathery leaf. From the base of this leaf the flower spathe or sheath is formed and contains the flower buds, these averaging from two to four buds to one single stem growing upwards out of the flower spathe, when they develop and break into bloom. It is sometimes necessary to split open the edge of the spathe with a penknife to assist the flower buds to push their way through. Some Cattleyas produce two leathery leaves from the top of the pseudo-bulb and differ from the labiata section in that their bulbs are more slender and the flowers are smaller, but to compensate for this the blooms are more numerous, with more variation in colours, as in *C. bowringiana* and others. Shading must not be too heavy and a certain amount of sunlight is necessary for the healthy development of the plants.

C. dowiana var. *aurea* is a splendid species from Antigua which should be placed in the warmest end of the Cattleya house. The flowers are a rich golden yellow with purplish veined markings on the lip. This plant is well worthy of particular attention. It requires a compost of osmunda fibre and sphagnum moss. Repotting should be undertaken about April, as soon as the plant begins to show new roots, when water must be given only in moderation. During the summer months when the new pseudo-bulbs are being built up, an ample supply of water should be given and the plant not allowed to suffer from dryness at the roots. After the new bulbs have become fully matured the flower buds will form and gradually push their way up through the sheath and open probably by October. After flowering the plant will require a rest and water should only be given at rare intervals, and then only sufficient to keep the bulbs plump and the foliage fresh. The plant should be kept in a dryer position during the winter.

As with other Cattleyas, when the blooms have been cut the flower sheath should be taken off and the cut rubbed over with powdered charcoal as a preventive against rot or decay setting in.

C. gaskelliana from Venezuela flowers about September. The flowers vary in shades and markings, the paler tinted varieties being more numerous, while there are darker forms and also a white variety. As with all Cattleyas, unless the plants are in flower, repotting is better done in the spring, as soon as the new roots make their appearance, or better still just before they do so. Then there is no danger of damaging the new tender roots which are easily broken, and at the same time the new roots will be able to enter into the fresh compost. Repotting should not be necessary unless the leading growths have extended beyond the rim of the pot.

In repotting Cattleyas or orchids of similar growth, they must be potted firmly in a compost of 3 parts of osmunda fibre and 1 part of sphagnum moss, bringing the new compost well up under the base of the leading growth so that the plant sits firmly when the work is completed. It is usual to support the pseudo-bulbs with a neat stick to ensure the plant being kept steadily in position. When the plant has been repotted and the surface neatly trimmed off the result should be a slight mound, the edges of which should be a good ½ inch below the rim of the pot to allow for future watering. It is also necessary to provide ample and swift drainage by placing large crocks standing on edge, at the bottom of the pot to half the depth of the pot.

C. labiata is a beautiful species first introduced into this country about 1818 from Brazil. The variable flowers are often a dark mauve colour with a rich purple lip. It may be grown either in pots or teak baskets and placed in a good light otherwise treatment is the same as for *C. gaskelliana*.

C. *mossiae*, another native of Venezuela, deserves to be represented in every collection. The labellum is richly coloured crimson and rose with yellow markings, the petals usually being a light rose shade. The flower itself is large and variable and is produced during early summer. C. *mossiae wagneri* is a white variety with an orange blotch in the throat and does well in a position near the glass.

C. *bowringiana*, a species from Honduras, has stems often 18 inches high carrying eight or nine rosy-purple flowers per spike during the autumn.

C. *intermedia* is from Brazil and is a fine late summer flowering species with slender pseudo-bulbs, 10 to 15 inches high. The flowers are a deep rose with a lip of purple.

C. *loddigesii*, also from Brazil, has slender pseudo-bulbs 12 to 18 inches high and the blooms are lilac-rose with a small blotch of yellow on the labellum. They are produced during late summer and last for a long time.

C. *schroderae*, from New Granada, has bulbs that are more club-shaped. The flowers are a beautiful uniform blush rosy shade with a large orange blotch on the lip. It is a fine variety and well worth a place in any collection. It may be grown in either baskets or pots.

C. *mendelii* is another fine orchid from New Granada which has large handsome flowers, delicately tinted blush rose petals and a crimson lip with rose and yellow markings. These flowers are variable in colour. The plant flowers during early summer and succeeds best in a light position near the glass.

C. *trianae* is an early flowering species from New Granada, producing its flowers in February and March. The flowers are often not as large as those of other varieties and the general colouring is rose with crimson-purple lip, although there is some variation.

C. *skinneri*, a native of Costa Rica, flowers about May and is an easy orchid to cultivate, requiring the same treatment as any other Cattleya. The flower stems are 10 to 15 inches high with flowers of rose-purple shades.

C. *percivalliana*, from Venezuela, produces flowers of medium size during January or February. The petals are usually deep rose with a richly coloured lip, but there is some variation in the colour of the blooms.

The foregoing are a dozen desirable Cattleya species, but there are many more for the amateur to select from. The cultural requirements are much the same for all Cattleyas. In addition to the plants described above there are numerous splendid hybrids far surpassing any of the old species.

Here are a few Cattleya hybrids, stating the parentages, as a guide to assist in making a choice of inexpensive Cattleyas:

Cattleya Acle (Gatton Ruby x Princess)
C. Archimedes (*armstrongiae* x *fabia*)
C. Arctic (Mlle Louise Pauwels x White Empress)
C. Ben Nevis (Alcineda alba x *intertexta* Julietteae)
C. Cades (Angelina x Lady Veitch)
C. Duchess of York (Empress Frederick x Rhoda)
C. Fabia (*dowiana* x *labiata*)
C. Portia (C. Bowringiana x *labiata*)
C. President Wilson (Fabia x *labiata*)
C. Princess Royal (Fabia x *hardyana*)
C. Thetis (Delphin x Titrianae)

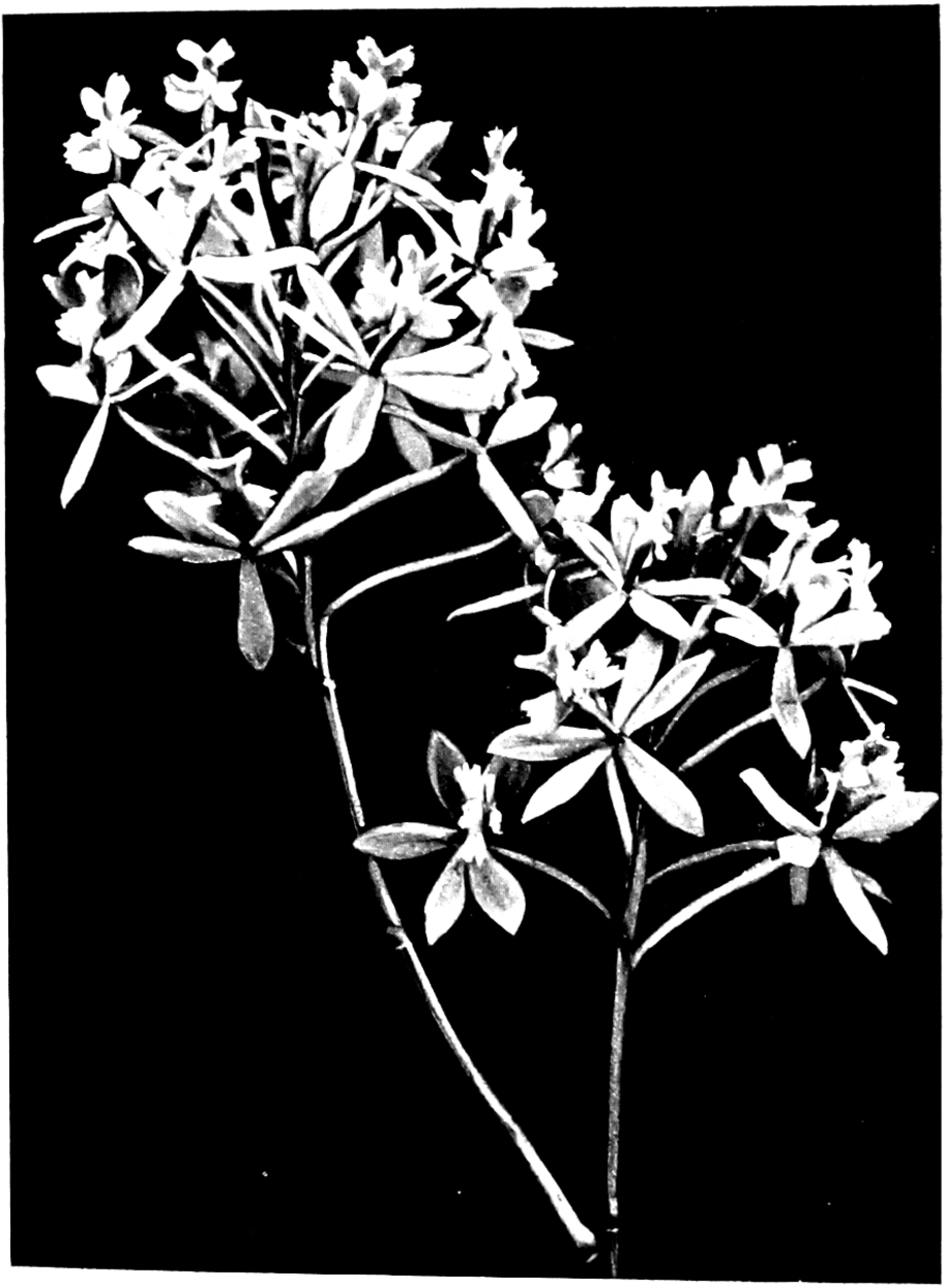
LAELIA AND LAELIOCATTLEYA

Laelias are a genus of very pretty orchids originating from Brazil and Mexico, differing from Cattleyas in that they have eight pollinia instead of four as in the Cattleyas, and the flowers have narrower petals although the colouring is very similar. By crossing them with Cattleyas, Laelias have been and are used extensively as the parents of many fine hybrids which then become known as Laeliocattleyas. The following are a few of the Laelias suitable for the intermediate house.

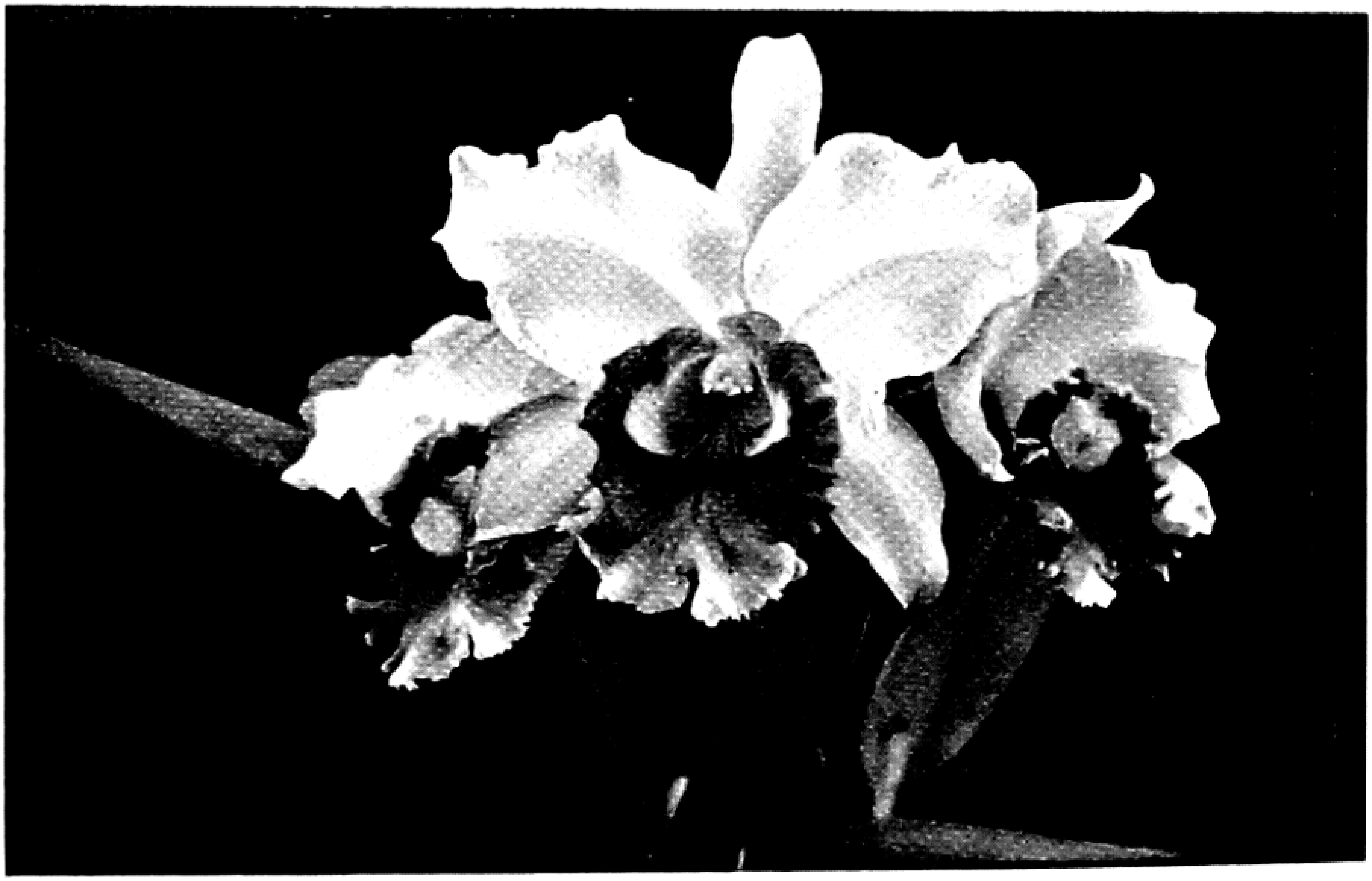
Laelia anceps flowers during December and is of easy culture. The flowers, sometimes six on one spike, are rose-lilac with a lip of purple crimson. They are somewhat variable in colour, some having white segments, and the darker shades are more in demand. This plant may be grown in pots or baskets near to the light with very little shading. It flowers all the better if not too much shading is given and plenty of air supplied. It may also be grown at the warm end of the cool house. *L. anceps sanderiana* is a fine white variety.

L. purpurata is very much like a Cattleya in appearance. It may be grown on the staging as near to the light as possible. This plant continues to grow throughout the winter as well as in the summer and, therefore, requires no definite resting period. It flowers either in May or June, the blooms varying from almost pure white to dark rose with a lip of purplish-crimson.

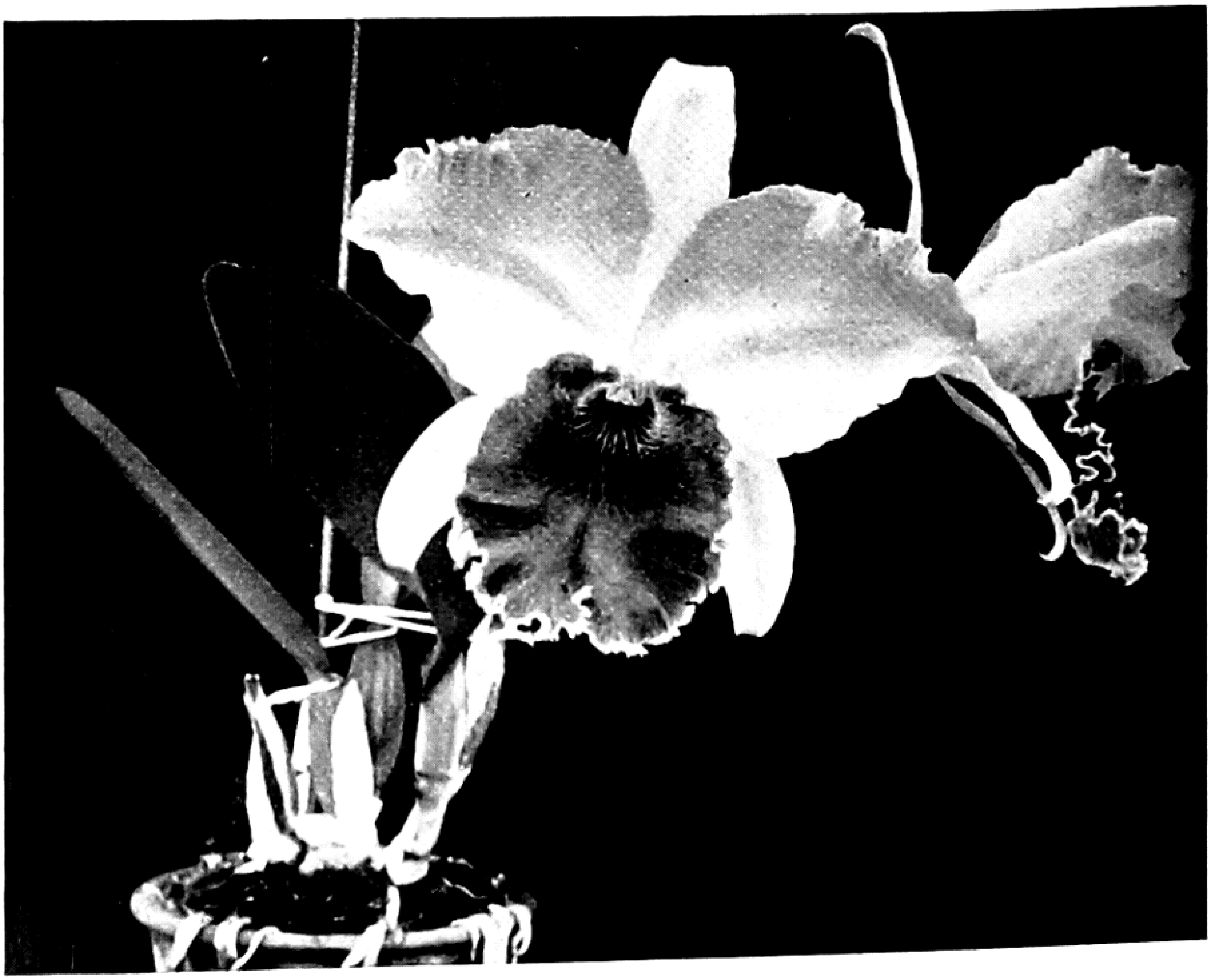
L. crispa has pseudo-bulbs 8 to 10 inches high and carries large flowers of whitish colouring and crisped lip of purple. This orchid flowers in the late summer months.



Epidendrum obrienianum (*natural size*)



Laeliocattleya 'Royal Crusader'



Laeliocattleya 'Miriam Marks'

L. tenebrosa is a spring flowering plant with flowers a reddish-brown with a lip of purple.

L. autumnalis has bulbs about 4 inches high with tall flower spikes. The flowers, which are produced in the late autumn, are rosy-purplish and are scented. This plant is sometimes accommodated in the cool house at the warmest end.

With these half-a-dozen Laelia species we pass on to the many splendid hybrids between Laelia and Cattleya known as Laeliocattleyas. They are an extremely popular section and 2,000 or more crosses have been made. All are extremely beautiful and vigorous. They require the same cultural treatment as Cattleyas and the following are a dozen good varieties. The parentages are given as a guide. The final selection must perforce be left to the amateur's own personal choice.

Lc. Albula (*Lc. schroderae* x *C. hassallii*)
Lc. Aphrodite (*C. mendelii* x *L. purpurata*)
Lc. Balkis (Lc. Queen Mary x *C. peetersii*)
Lc. Elissa (Lc. Ishtar x C. Dinah)
Lc. Excellent (Lc. St Gothard x C. Remy Chollet)
Lc. Golden Crescent (Lc. luminosa (aurea) x C. Mimosa)
Lc. Jervis Bay (Lc. Crowborough x Lc. Windermere)
Lc. Jevington (Lc. Benenden x Lc. Hyperion)
Lc. Miriam Marks (Lc. Princess Margaret x Lc. Princess Frolic)
Lc. Princess Margaret (Lc. Profusion x C. Clotho)
Lc. Rusper (Lc. Narcissus 'Beauty' x Lc. Poynings)
Lc. Victor (Lc. Purple Emperor x Lc. Rubens)
Lc. Windermere (Lc. Momus x *C. trianae*)

BRASSOCATTLEYA, BRASSOLAELIOCATTLEYA, BRASSAVOLA, SOPHRONITIS GRANDIFLORA, SOPHROLAELIOCATTLEYA

Hybrids between Brassavola and other genera

From the Cattleyas, Laelias and Laeliocattleyas, we come to the many hybrids produced from the species *Brassavola digbyana* which has been used because of the beautifully fringed lip carried by this flower. Crosses have been made with excellent results between the genera Brassavola and Cattleya and are known as Brassocattleyas while the trigeneric hybrids between the genera Brassavola, Cattleya and Laelia are known as Brassolaeliocattleyas. All require the same cultural treatment as Cattleyas and may be grown in the same house. There are also crosses between Brassavola and Laelia known as Brassolaelias, but they are not comparable with the other hybrids mentioned on page 123, the petals and sepals being narrower and lacking in colour. For this reason the other two hybrids enjoy a greater demand although the lips of Brassolaelias are outstanding.

Brassocattleyas

These are among the most elegant and beautiful of orchids. The petals of the flowers are bold and large while the labellum is extra large in size, heavily fringed, and outstandingly beautiful. The following is a good selection of Brassocattleyas:

Bc. Amberly (Bc. Mrs J. Leemann x C. Princess Royal)
Bc. Bloom (*B. glauca* x C. Remy Chollet)
Bc. Diadem (*B. digbyana* x C. Eleanore)
Bc. Ditchling (Bc. Marie Marie x C. Petalina)
Bc. Elia (Bc. Ilene x C. Jasper)
Bc. Heatonensis (*B. digbyana* x *C. hardyana*)

Brassavolas

The Brassavola species are natives of tropical America and have fleshy leaves, the flowers being produced from the end of the bulb. In *B. digbyana* the bulbs are about 6 inches tall and bear a large flower with a heavily fringed lip, the petals being whitish, sometimes tinged with green. *B. glauca* has a neater habit with similarly shaded flowers. Both these orchids have been extensively used for breeding purposes and are mentioned here for that purpose. They are also referred to on page 138. The result of breeding with these Brassavolas is seen in the many fine modern hybrids, but these two species themselves are not now generally in cultivation and are seldom seen in a collection.

Brassolaeliocattleyas

Very many fine hybrids have been produced, all of which are extraordinarily attractive, especially where *Brassavola digbyana* has been used. Among these we have Brassolaeliocattleya Elizana (Queen Elizabeth x C. Dupreana) a very fine variety; Orbit (Electron x Mithra); Triune (Bc. Digbyano-Schroderae x. Lc. Hyeana); Antoinette (Bc. Helen x C. Portia); Appledore (Bc. Estelle x Lc. Invicta) Royal Crusader (Blc. Crusader x Lc. Princess Margaret) and many others.

Hybrids between Sophronitis and other genera

Finally we have garden raised hybrids between the genera Sophronitis and Cattleya known as Sophrocattleya, hybrids between Sophronitis and

Laelia known as Sophrolaelia and tri-generic hybrids between Sophronitis, Laelia and Cattleya termed Sophrolaeliocattleya. Many of these latter are among the latest hybrids and a few are listed below. Sophrolaeliocattleya Cicily Watson (SLc. Vulcan x Lc. St Gothard); Cleo (SLc. Meuse x *C. labiata*); Amberley (SLc. Hermes x Lc. Santa Claus); Sunburst (SLc. Sunburst x *S. grandiflora*).

Sophronitis

This genus of epiphytic orchids is of dwarf habit, rarely exceeding 4 or 5 inches in height. *S. grandiflora* is a little gem with its brilliant scarlet flowers, borne singly or in pairs on the stem, averaging in size an inch across. It may be grown in small pans suspended from the roof and should be kept well shaded without direct exposure to the sunlight and kept moist all the year round. It will thrive in the coolest end of the intermediate house or the warmest end of the cool house where it will flower during the autumn and winter to be admired by all who see it. When repotting becomes necessary this may be done soon after the flowers are finished, using a compost of equal parts of osmunda fibre and sphagnum moss. Of this small genus this is the only one which is worth adding to the collection. It is a native of Brazil and it is the brilliance of the flowers which has induced the plant breeder to use it for crossing so extensively with the Cattleyas to produce the hybrids mentioned above.

CYPRIPEDIUM

Cypripediums suitable for growing in the intermediate house are usually those that have mottled leaves. This mottled foliage may be taken by the amateur as an indication that these orchids require more warmth than the green-leaved varieties and may be included in a mixed collection. Cypripedium species are not so frequently met with in collections since there are numerous beautiful hybrids available, but the following are a few which may be cultivated and which should be kept at the warmest end of the intermediate house.

Cypripedium curtisii has large, bold flowers usually produced in spring or summer. The dorsal sepal is green and white with dark veining, the petals have dark spots on them and the pouch is purplish in colour. The foliage is prettily marked and tessellated. This species originates from Sumatra.

C. niveum, from the East Indies, is of dwarf habit and flowers during the summer. The flowers are roundish in outline, and are pure white with a few tiny purplish spots.

C. bellatulum allied to the preceding species is from Cochin China. It has tessellated foliage and white flowers with purple spots. This also flowers during the summer.

C. lawrenceanum should be kept at the warmest end of the house as it comes from Borneo. It should also be kept shaded. It is a handsome plant with its ornamental leaves and fine flowers produced during the summer. The dorsal sepal is white, striped purple.

C. hirsutissimum. This is a green-leaved variety which carries attractive large flowers. The general colouring of the bloom including the dorsal sepal is purplish-green. It may be grown in the warm end of the cool house.

Only after the most careful persevering efforts and patience on the part of the plant breeder have the modern Cypripedium hybrids been produced. There are now exquisite hybrids in existence and the improvements over the parents are such that, but for the records kept, the parentages would be quite unrecognizable. The vast strides made in the texture, colour, size and beauty of these long-lasting flowers is extraordinary and the length of stem and other attributes have not been ignored.

The following are a few of the many hybrids available:

Bromilaud (Bromilowianum x *maudiae magnificum*)
Madelon (Delenatii x Mem. J. H. Walker)
Madame Barbey (*lawrenceanum* x *tonsum*)
Olivia (*niveum* x *tonsum*)
Psyche (*bellatulum* x *niveum*)

There are untold numbers of these desirable hybrids and to attempt to continue the list is quite beyond the scope of this book. The best plan is to visit an orchid nursery when the plants are in flower and they may be inspected and selected at leisure.

Those who have an extra warm spot in the house, usually the end where the boiler is installed and where a minimum temperature of 60° F. can be maintained, can grow there the beautiful *C. maudiae magnificum*. This orchid is of strong constitution and the flower is of good solid texture, a beautiful shade of pale pea-green. The bold dorsal sepal is white, lined with stripes of a slightly darker shade of green, the petals being a similar colour with tufts of tiny hairs fringing the top. The pouch is shaded green and is prominent. The flower is carried on a strong hairy stem well above the foliage. These plants thrive in a well shaded position and luxuriate in an atmosphere containing ample moisture.

SELENIPEDIUM (SYN. PHRAGMIPEDIUM)

Selenipediums (now called Phragmipediums by botanists) are the South American representatives of the genus Cypripedium. The leaves are large, leathery and strap shaped. The flower scape produces flowers in succession and these with their long, often twisted, ribbon-like petals have a curious attraction.

S. caudatum is a species which flowers during early summer and has large flowers with ribbon-like petals, often 20 to 30 inches long.

S. dominianum is a hybrid from *S. caricinum* and *S. caudatum*. The flowers have the characteristic long petals. These are 8 inches long and are pale yellow and rose with green veins. The pouch is large, yellowish green with brown veins.

S. longifolium has leaves nearly 2 feet long and flowers with a green and veined dorsal sepal. The petals are long and twisted. The flowering period varies.

S. roezlii from Colombia is an interesting plant. It produces its flowers of a light rose shade in succession from the same stem for a considerable period, beginning in April, but these flowers lack the long ribbon-like petals.

S. grande macrochilum is a hybrid between *S. caudatum lindenii* x *S. longifolium*. The variety *giganteum* being considered the finest of the type.

They make fairly large plants compared with Cypripediums. The flowers are carried on tall erect stems usually in threes, with long twisted ribbon-like petals reaching past the level of the pot. They are long-lasting, giving a most effective display.

Where space permits a few Selenipediums are worthy of a place in any collection and they should be given treatment similar to that which is required by Cypripediums.

DENDROBIUM

There are many Dendrobiums which, to obtain the best results, should be grown in the intermediate house where the shading is not so heavy as in the cool house and where an atmosphere more heavily laden with moisture is maintained during the summer months.

Dendrobiums can withstand a very high tropical temperature during the summer when they will make rapid growth and may be syringed overhead fairly heavily during hot weather to encourage them to make good progress. Towards the autumn their new pseudo-bulbs will have completed their growth. This is indicated by the presence of a terminal leaf at the tip of the bulb. When this stage has been reached, watering may be gradually reduced and all overhead spraying discontinued. The plants will require more direct light and air to ripen the bulbs and to ensure the production of a full crop of flowers in the spring. During the winter months very little water must be given, and that only if signs of shrivelling of the bulbs are seen. Too much watering during the winter will lead to premature growths being produced from the pseudo-bulbs at the expense of flower buds.

As the spring approaches, signs of green swellings will appear at the nodes of the bulbs. These swellings should materialize into flower buds and when this has happened, the plants may be awakened from their winter sleep by gradually increasing the frequency of watering. At the same time a green swelling will be noticed at the base of the leading bulb. This swelling is the beginning of a new bulb, which will be built up during the coming season.

If the plants make premature growths from the sides of the nodes instead of flower buds, these may be allowed to remain until they are large enough to remove, that is when they are about 1½ to 2 inches in length and are making their own aerial roots. At this stage they may be taken off and potted up singly into tiny pots and allowed to grow on and by the end of the season they will probably have made a secondary pseudo-bulb of moderate size. Do not make the mistake, however, of removing a growth from the base of a bulb, for this will grow into a pseudo-bulb which will be needed for flowering.

Dendrobiums require copious supplies of water during the summer which is their growing season. Accordingly swift drainage must be provided for in the compost, with sufficient crocks in the base of the pot. A suitable compost consists of osmunda fibre and sphagnum moss in equal parts and firm potting is essential, using a pot as small as possible. After the flowers have been removed, repotting may be undertaken during the spring.

Dendrobium species are distributed over a wide area, including the Philippines, Assam, Burma and India. They vary considerably in height, sometimes the bulbs are only 3 inches high, while in other species they may reach 5 or 6 feet. The production of the flowers also varies considerably, some plants producing their blooms in clusters of two or three from the nodes, while some have upright apical spikes and others carry their flowers in drooping clusters.

D. aureum, from the East Indies, produces its flowers from the nodes in early spring, the deliciously scented blooms being golden yellow in colour, with the lip marked brownish.

D. brymerianum has large golden-yellow flowers with deeply fimbriated lips, borne in racemes. It blooms in the spring.

D. chrysotoxum has long apical spikes of golden yellow flowers with an orange blotch.

D. coelogyne has solitary flowers of greenish yellow, flecked with red, the lip being purple.

D. crumenatum from Malaya, sometimes known as the 'Pigeon Orchid', is white flushed with pink, the lip having a primrose blob. This orchid is scented.

D. densiflorum comes from the Khassia Hills in Assam and is another beautiful spring-flowering orchid. The flowers are golden yellow with an orange lip, and are borne in dense pendulous trusses. It is similar in habit to *D. thyrsiflorum*.

D. falconeri, from Northern India, is a pretty Dendrobium which flowers during May. The flowers are white, tipped with purple, the lips edged with yellow. It blooms in the spring.

D. fimbriatum produces its brilliant yellow flowers in the spring. These have a fimbriated lip with a reddish blotch.

D. gibsonii has golden yellow flowers with two crimson blotches. The flowers are produced in racemes during the spring.

D. jamesianum comes from Moulmein, Burma, and has black-haired stems carrying in apical clusters white flowers with lips marked cinnamon red.

D. thyrsiflorum is also from Moulmein, which has a hot climate, and it should, therefore, be placed in the warmest part of the house. The stems are thick and the flowers, produced in drooping thyrses, are white, often flushed with pink, with a lip of golden orange.

D. wardianum, a native of Burma, is a fine species with stout stems, producing its flowers from the nodes. They have pure white petals tipped with purple and a yellow disk on the lip.

There are very many other fine Dendrobium species which may be included in the intermediate house and also many more for the stove house, not included here, but which may be tried out at the warmest end of the intermediate house.

Apart from the species, as with other orchids, there are innumerable hybrids, suitable for the intermediate house, from which the amateur has unlimited choice. A few of these choice named hybrids are as follows:

D. Austinii (Ainsworthii x Cybele)

D. Berwick (Ceylon Glory x Pamela)
D. Gatton Monarch (Lady Colman x *nobile* (Harefield Hall))
D. Gatton Sunray F. C. C. (*dalhousieanum* x Illustre)
D. Hanburyii (*dalhousieanum* x *fimbriatum oculatum*)
D. Merlin (*nobile* x Queen of Gatton)
D. Zeno (chessingtonense x Thwaitesiae)

MILTONIA

Miltonias when grown well are beautiful and highly decorative orchids which in good moist shady conditions make rapid growth, but given indifferent treatment they soon deteriorate. These plants may be housed during the growing period at the coolest end of the intermediate house, as they really require a little more warmth than Odontoglossums. After the growing period the plants may be rested in the cool house.

Miltonias usually flower during May and after flowering, when the spikes have been cut, the resting period begins and continues until August. During this period, as the plants only take a partial rest they should be given only sufficient water to prevent the pseudo-bulbs from shrivelling. Any overhauling or repotting may be done at the beginning of April or the beginning of September. The larger plants may be divided, removing all dead roots or unwanted back pseudo-bulbs, remembering to use as small a pot as possible. A good compost consists of 3 parts of osmunda fibre and 1 part of sphagnum moss, to which may be added a portion of old, partially decayed beech or oak leaves, rubbed small. Careful watering will be required after repotting and moderation should be exercised until it is observed that new young roots are being produced, after about five to six weeks, when water may be given more frequently. The plants must not, however, be kept in a perpetually wet condition, and it is better to err on the dry side, especially during the winter. During the summer the plants may be given a light overhead spray. Under wrong treatment, by giving the plants too much water or keeping them too cold, the leaves have a habit of decaying at the tips, the first indication being a watery appearance at the spot, which must be cut away to prevent the decay spreading down the leaf.

Miltonias are natives of South America and include such species as *M. phalaenopsis,* which has narrow leaves with spikes of rosy-white flowers, the lips being blotched with purple. This plant flowers during late spring.

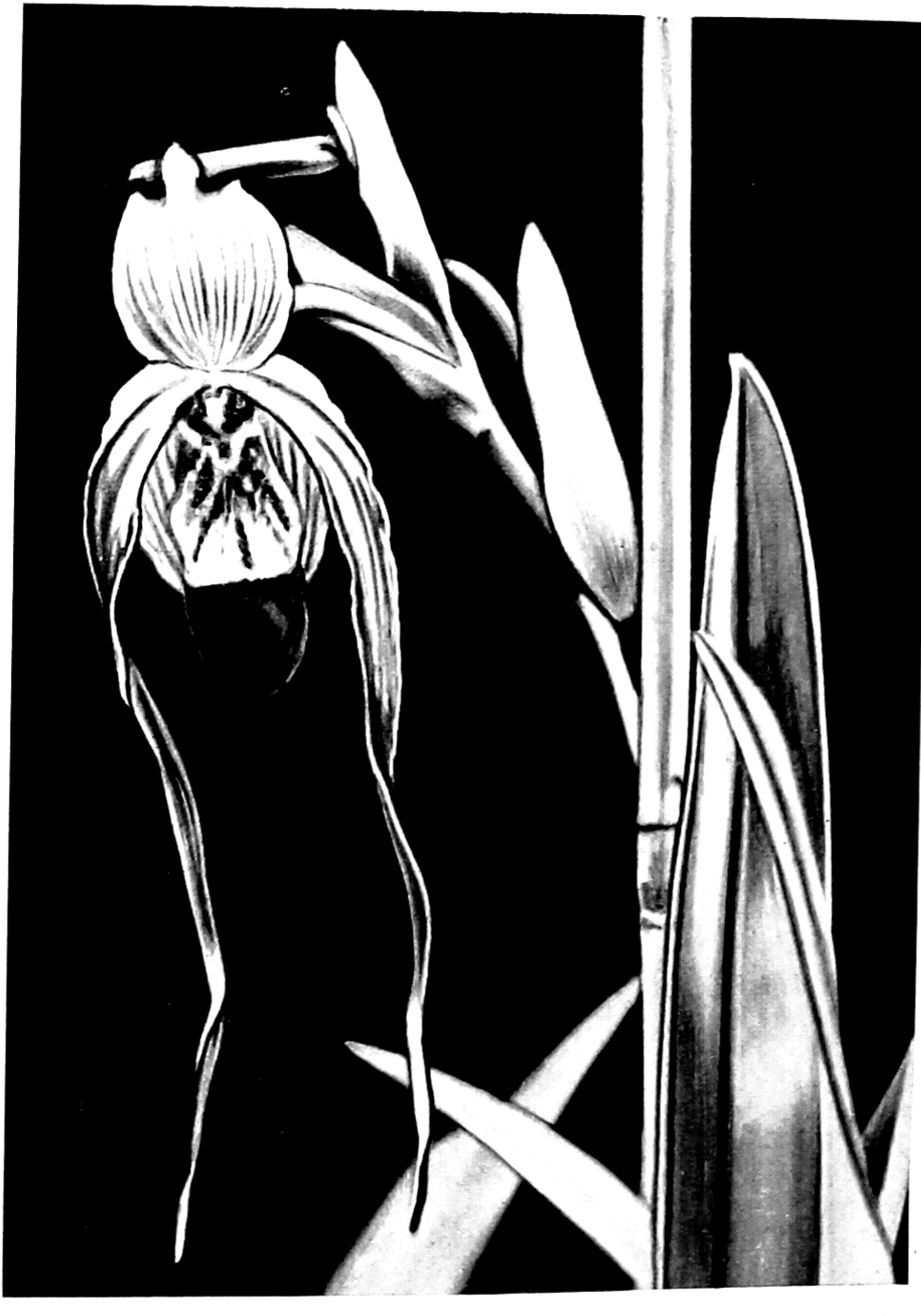
M. spectabilis, which flowers in the summer, has rosy coloured blooms with a broad lip.

M. vexillaria from Guatemala blooms during May and has flattish oval

Right: Cypripedium 'Mist of the Moon'

Below: Miltonia hybrids

Below right: Phalaenopsis 'Dingledon' is a delightful hybrid with pink flowers and mottled foliage



Selenipedium grande macrochilum giganteum *has long trailing appendages often 24 inches long* bulbs, the spikes carrying large flat lilac-rose flowers. The flowers are, however, variable, some being almost white while other plants produce flowers of darker and richer colours, these being the better varieties.

M. warscewiczii, a native of Colombia, also has flattish bulbs, and produces reddish flowers with a rosy-purple lip during the spring.

M. roezlii is a charming orchid bearing flowers of pure white, with a red or yellow eye in the centre. It usually does well at the coolest and dampest end of the intermediate house. The plant is a native of Colombia.

Apart from the species there are now great numbers of hybrids which, like the species, usually flower about May, require the same treatment and will grow well in the intermediate house.

A few choice Miltonia hybrids are: M. Beethoven, M. Flora, M. Melina, M. Red Admiral, M. Cardinal, M. Dawn, M. Nadia and M. Velvet Charm.

The range of colours provided by Miltonia hybrids is very wide, extending from pure white to very rich crimson and ruby, with all manner of intermediate shades. The greatest demand is for the fine, dark, rich colours.

For the amateur who wishes to grow a few of these hybrids, perhaps the best plan is to purchase young unflowered seedlings and grow them on to the flowering stage. This is well worth attempting and, during the early stages of their growth, these young plants, which are naturally more tender, should be kept well shaded in a good moist atmosphere.

VANDA

These interesting epiphytic orchids are found throughout the warmer climates in the East. Many of them are suitable for inclusion in the intermediate house, where they should be given as much light as possible. They may be grown suspended from the rafters or on the staging and given plenty of fresh air. Vandas will not tolerate heavy shading, which only results in the plants failing to flower, in fact they flower all the better for being subjected to direct sunlight during the late summer and autumn. During the spring and summer months the plants may be sprayed overhead frequently during the day and require an atmosphere heavily charged with moisture, calling for regular damping down to maintain these conditions. Frequent light dampings are more effective than heavy damping at longer intervals.

The pots in which Vandas are grown should contain broken crocks or brick rubble to about half their depth, the remaining space being filled up with a compost of 2 parts of osmunda fibre and 1 part of sphagnum moss. Repotting is only rarely necessary, but the surfacing compost may be replaced each spring by fresh material.

Vandas and other tall-growing subjects are in time likely to lose some of their lower leaves, giving the plants a tall leggy appearance. When this happens the plants will often produce new roots just below the base of the foliage and as soon as these are seen the stem may be severed about 5 or 6 inches below the new roots and the top part of the plant potted up. The bottom portion of the plant may be retained as it is and placed in a propagating frame, where it will often, in time, produce new side shoots which eventually may also be taken off and grown on separately. Vandas have erect stems with distichous evergreen leaves, the scapes which carry the growers emerging from the axils of the leaves.

V. caerulescens, from Burma, bears pale mauve-blue flowers with a lip of violet, in spring and summer.

V. cristata, a native of Northern India, has yellowish flowers with a deep purple lip.

V. hookeriana which is found in Borneo and Malaya, may be grown at the warmest end of the house. The stems are 3 or 4 feet high with flowers 2 inches across, white flushed with pale purple and with darker spots.

V. parishii has short stems and scapes sub-erect, bearing fleshy greenish-yellow flowers spotted brown and with a magenta purple lip, the flower is scented.

V. sanderiana flowers in late summer and is extremely beautiful. The flowers, 5 inches across, are shaded rose marked with veins and reddish coloured spots.

V. parviflora, a summer flowering species, has buff coloured flowers with a bluish lip.

V. suavis. The leaves of this orchid are 12 to 18 inches long and its stems are 3 to 4 feet in height. The fragrant flowers are white, barred and spotted purple with a lip of rosy-purple.

V. teres has cylindrical leaves, tall, rounded stems and large, rose coloured flowers, with an orange lip. It flowers in spring and summer.

V. tricolor is another exotic orchid, 3 to 4 feet high with leaves 15 inches long. It bears whitish yellow flowers marked and striped with red.

Like all other orchid hybrids, Vanda hybrids are generally more expensive than the species as they have been artificially raised and there has been much improvement on the original species. The following are a few desirable hybrids:

V. Burgeffii (*sanderiana* x *suavis*)

V. Marguerite Maron (*suavis* x *teres*)
V. Miss Joaquim (*hookeriana* x *teres*)
V. Rothschildiana (*caerulea* x *sanderiana*)

ONCIDIUM

The genus Oncidium is a large one distributed over a wide area of the West Indies and South America. In consequence the requirements of these orchids vary according to the district from which they originate. Some may be grown in the cool house, others such as those described here, being suitable for the intermediate house.

Oncidiums are very similar in structure and cultural requirements to Odontoglossums, with the exception of a few which have no pseudobulbs but are furnished with leathery leaves and are more suitable for the stove house. A compost of osmunda fibre and sphagnum moss to which is added a small proportion of partially decayed oak leaves is suitable. Swift drainage should be provided, and the pots should always be as small as possible.

In general Oncidiums have fine handsome flowers borne in sprays, the prevailing colour being yellow, usually marked with reddish brown markings. The following are a few of the most interesting which are grown for their beauty and free-flowering habits. The spikes should be cut early to prevent the shrivelling of the bulbs and where a plant has become weakened through excessive flowering, it is advisable not to allow it to flower again until it has regained its vigour.

O. *cavendishianum*, a very pretty species from Guatemala may be included in this section, if it is kept at the warmest end of the house. The bulbs are very tiny and the plant has leathery leaves. The flowers are about 2 inches across, yellow, spotted with red. This plant blooms in the spring.

O. *ornithorhynchum* has flower spikes 1 to 2 feet in length, branched with a drooping habit, and the small fragrant flowers are of rose-lilac shades.

O. *crispum* is a variable species. The stout flower-spikes bear from twenty to fifty large segmented flowers, a rich chestnut-brown in colour, with red markings.

O. *forbesii* also has large flowers with broad segments, chestnut-brown in colour with yellow markings. This orchid flowers in the autumn.

O. *kramerianum* should be tried by all. It is a species of butterfly orchid from Colombia. The flower spikes are long and slender, 2 to 3 feet in length, bearing large flowers with the lower sepals and lip yellow marked reddish-brown. As one flower dies the spike extends and other flowers are produced in succession for several weeks.

O. papilio, as the name implies, is known as the Butterfly Orchid, and it is a perfect imitation of that insect. It should be placed at the warmest end of the house. It is a compact-growing orchid which throws out a long slender stem at the end of which the flowers are produced, following one another in succession.

BRASSIA

These are natives of tropical America, resembling the Oncidiums in many ways but differing from them in that the flowers have narrow elongated sepals and petals. Two species which may be represented in the Cattleya house are:

B. lawrenceana which has flower spikes 12 to 18 inches long, bearing in spring and summer fragrant, light yellow flowers spotted with brown, and *B. maculata* which has greenish-yellow flowers, spotted brown, in early summer.

COELOGYNE

The Coelogynes are useful plants and the genus is represented throughout the East. They usually produce their flowers from the young growths. Many of the Coelogynes are cool house plants, while others require warm house culture.

In the treatment of these orchids, repotting should be resorted to as little as possible, for it will be quite two years before the plants are sufficiently established again to produce their flowers. For this reason the plants are better grown in pans and as the rhizomes from which the roundish bulbs grow extend, they should be trained round the edge of the pan or towards the centre, gently pegging them down on to the compost instead of repotting. The compost may be kept faced up with fresh additions as required and any old, small or useless bulbs should be twisted off. This applies especially to *C. cristata* in the cool house. In this way the health of the plant is maintained and a full crop of flowers can be obtained. Where, however, a plant has got into such a state that repotting has become imperative, it should be knocked out of the pot or pan and taken to pieces, and many of the old useless pseudo-bulbs discarded. Then the strongest leads can be made up into one compact plant, arranging them so that they are growing round the pot or pan. Newly potted plants will require very careful watering for several weeks and water should only be given in moderation, while extra shading and overhead spraying will assist the plants to recuperate.

The bulbs of these orchids are apt to shrivel, but as root action increases they will naturally plump up again. No additional watering must be given at this stage for it will only have the reverse effect and any buds that are about to appear are likely to turn black and drop off. During the growing season very weak liquid manure may be given, care being taken not to overdo it.

C. *dayana* has pendent scapes often 2 feet or more in length. The flowers are yellow ochre in colour with a white lip marked chocolate. This plant flowers early in the summer and, because of its pendent scapes, it must be grown in a pan or teakwood basket and hung from the rafters. It should also be placed at the warmest end of the house.

C. *flaccida* also has drooping racemes and flowers during the spring. The flowers are whitish with a yellow disk on the lip. Like the preceding species it should be grown suspended.

C. *pandurata*, a summer flowering species, has pseudo-bulbs that are set fairly wide apart. The flowers are large, of a green shade and have a warted lip with black blotches. It requires the same treatment as C. *dayana*.

C. *speciosa* blooms at various times. The flowers are large with a yellow lip outside and brown inside.

C. *massangeana*. This orchid produces long pendent spikes freely and is best suited for basket culture, suspended from the roof, the pendent flower spikes often being 2 feet in length. Although this plant lacks brilliancy the yellow and brown flowers are very pleasing. The bulbs should not be allowed to become shrivelled, just enough water being given during the inactive stage to prevent this. During the summer liberal amounts of water may be given.

Other Coelogynes that may be tried are: C. *valida*, C. *tripliculata*, C. *pulchella*, C. *media*, C. *lawrenceana* and C. *balfouriana*.

STANHOPEA

These orchids are an extremely interesting epiphytic family from Central and South America. The flowers are large and very beautiful, excelling in richness of colour. Another characteristic is the remarkable construction of the lip and the wax-like appearance of the flowers. The foliage consists of one broad leaf from the ovoid bulb. The plants must be grown in baskets suspended from the roof and crocks must NOT be placed in the baskets, only sphagnum moss and osmunda fibre being allowed, since the plants are epiphytic and their habit is to push their pendulous flower spikes downwards through the compost to emerge below the baskets where they hang. Unfortunately the flowers are not long lived. Suspended as they are, from the roof, watering will be required all the year round in moderation and the leaves should occasionally be sponged down.

S. tigrina, a native of Mexico, blooms during the summer and has large flowers of great beauty, the colouring being either orange yellow and paler, barred and spotted, or dark blood red. In addition the blooms, although short lived, give off a strong perfume.

S. oculata is also a fine showy plant, the ground colour of the fragrant flowers being pale yellow, heavily marked with red spots. It usually flowers in late summer or autumn.

S. insignis, from Brazil, is just as showy as the two previous species, its large fragrant yellow, purple-spotted flowers being produced during the summer.

S. eburnea bears scented ivory white flowers during the summer.

S. wardii: another fine orchid, has fragrant large flowers, golden yellow in colour, spotted reddish purple, produced during the summer.

BRASSAVOLA

This is a small group of orchids from tropical America, comprising about a dozen species. The bulbs are flat and have fleshy leaves, the flowers being produced from the apex of the bulbs. Brassavolas are suitable for inclusion in the Cattleya house, and they require as much light as possible and a decided rest during the dormant period.

B. digbyana blooms during the autumn, the flowers being greenish-white in colour with a lip that is well fringed and broad. The bulbs are 5 to 6 inches high with one fleshy leaf.

B. glauca, a plant of neat habit, flowering in spring, has white flowers tinged with green.

B. nodosa blooms during the autumn and has white flowers with a spreading lip.

Other Brassavolas include:

B. flabelliformis, *B. perrinii*, and *B. tuberculata.*

BULBOPHYLLUM AND CIRRHOPETALUM

These are interesting and curious plants, closely allied to each other and mainly of botanical interest. They are of dwarf growth, and the flowers, in which the sepals are considerably developed, are very often umbel-like.

Both Cirrhopetalum and Bulbophyllum require a compost of equal parts of osmunda fibre and sphagnum moss mixed with finely crushed crocks, and they should be grown in small pans which can be suspended for the small growing kinds and put into baskets for the larger types. Those with hard bulbs and leaves require a decided rest in the winter while the softer growing kinds require water throughout the year, but discrimination must be used in its application. A moist atmosphere and shading not too heavy and a semi-tropical temperature in the summer and a winter temperature of 65°–70° suits the species described below.

Bulbophyllum barbigerum is a summer flowering plant of dwarf habit with very small bulbs. There are about six to eight flowers with dark purple lip-like tufts of hair to each spike. The yellowish lip is so long and narrow that it moves with the slightest movement in the air. The flowers have chocolate-brown sepals.

Cirrhopetalum medusae has clusters of small ivory coloured flowers, borne in summer and autumn.

C. picturatum has yellowish-green flowers with the upper sepal spotted with red. It flowers at various seasons.

C. robustum blooms during the summer and bears fairly large flowers which appear glossy. These flowers are yellow with a brownish-red coloured lip.

C. rothschildianum produces during the autumn darkish purple flowers traced with yellow.

C. guttulatum has pale yellow flowers spotted with purple.

In addition to the above there are very many more species, all of which require similar conditions and for those who are interested in species of botanical interest, reference should be made to the catalogues of those orchid growers who specialize in them.

SOBRALIA

These orchids, found in Central America, produce large flowers from the ends of the stems. They are tall growing subjects and a place may be found for them where there is ample head room in the house. The stems are tall and reed-like, clothed in leaves. Cultural requirements are the same as for other orchids in the intermediate section.

S. macrantha has stems 5 to 7 feet high and flowers during the summer. The flowers are dark crimson and have a broad lip.

S. rosea reaches 6 feet in height and has rosy coloured flowers with a crimson lip. This species flowers during the summer.

S. sanderae is tall growing, up to about 6 to 8 feet, and it blooms during the summer, producing rose shaded blooms with a dark crimson lip.

S. xantholeuca will grow to 8 feet high and bears creamy coloured flowers with a darker lip, during the summer.

PHALAENOPSIS

Strictly speaking these exotic epiphytic orchids should be grown under warmer conditions than those usually given to intermediate house orchids. But they are such lovely and rewarding plants to grow that I have included them in this book in the hope that a warmer spot may be found for them. They may be grown in a house where the night temperature does not fall below 57°F. at any time but an extra 3°F. to make the minimum temperature 60°F. is nearer the ideal during the winter nights.

The Phalaenopsis species originate from the far East, Siam, Borneo, the Celebes islands, the Phillipines and neighbouring tropical lands. It is a very varied genus and is frequently called the Moth Orchid because it resembles the tropical moths. They are not tall growers and only produce two or three leaves annually, broad and leathery in texture, sometimes attractively mottled. They are quite free-flowering, the flowers appearing over a period of some months. The flowers are delightfully arranged on the long stems in even formation, all facing the same direction and lasting in good condition for up to two months on the plant.

The growing period is approximately from March to October; it is after this month that the flower spikes begin to appear. If the first sprays are cut directly below the bottom flower, leaving a stem with a few nodes on it, a second and possibly a third spray of flowers will develop from these nodes.

Phalaenopsis are adaptable for either growing on teak-blocks, fibre bark, in baskets or in ordinary clay pots. If they are grown in pots plenty of drainage must be supplied by half filling the pots with crocks. Do not overpot. A compost of osmunda fibre and sphagnum moss is all they require. Whatever method is adopted the containers can all be hung up in the greenhouse provided they are not placed too near the glass.

The best time for re-potting is after flowering when the new roots begin to make their appearance. In many cases it is only necessary to topdress with fresh compost working this in between the roots which are adventitious often attaching themselves to the sides of the pot or anything else they may come in contact with. The same method may be adopted for the plants established on bark or in baskets. As I have already mentioned, these orchids come from the tropical, warm, humid areas and must be treated accordingly, raising the summer temperature to approximately 65°F. at night, with a definite increase by sun heat during the daytime under shady, humid conditions, when they may be watered with abundance. Hence the necessity for complete and swift drainage when grown in pots. A light overhead spraying during bright summer mornings is beneficial. Fresh air should be given whenever possible, especially when the plants are in flower: a stagnant atmosphere will cause the blooms to become spotted.

There are quite a few species from which to select and possibly the most popular is *Phalaenopsis amabilis* from Java, Borneo and the Phillipine islands. This orchid flowers with us during the winter, the blooms being anything between 3 to 5 inches in diameter with pure white sepals and petals. The lip is tinted yellow and spotted with red.

P. aphrodite, similar to *amabilis* with small flowers, the spray being of a drooping habit. This species is from Java and the Philippines.

P. lowii, of smaller habit with flower spikes about 12 inches long. The white, rounded flowers have a purple base and a white lip with a purple central lobe. It comes from Moulmein, Burma.

P. rosea, a delightful species from the Philippines with small leaves and branched flower spikes carrying many blooms about 1½ inch wide. The white, purple tinted sepals and petals have a rose-purple lip.

P. sanderiana, another exotic species from the Philippines with large speckled foliage and spikes up to 3 feet long carrying numerous flowers 3 inches across. The sepals are delicate rose; the white lip has a yellow base. There is a white variety, *alba*, which has some pale purple spots on the base of the lip.

P. schilleriana is an old friend of easier culture than most with larger leaves. The flower spikes are branched, 3 feet long, arching in habit and carrying numerous flowers, 3 inches across, pale rosy-purple shading to white. Also from the Philippines.

There are, of course, many other desirable species and the following are only a few beautiful hybrids of which there are many more:

P. Amphitrite (*P. stuartiana* x *P. sanderiana*)
P. Artemis (*P. rosea* x *P. amabilis*)
P. Vesta (*P. aphrodite* x *P. rosea*)
P. Gilles Gratiat (*P. aphrodite* x *P. rimestadiana*)

LIST OF SPECIES, HYBRIDS AND VARIETIES

- *Brassavola digbyana*, 123, 124, 138
  - *flabelliformis*, 138
  - *glauca*, 124, 138
  - *lodosa*, 138
  - *perrinii*, 138
  - *tuberculata*, 138
- *Brassia brachiata*, 102
  - *elegantula*, 102
  - *lawrenceana*, 136
  - *maculata*, 136
  - *verrucosa*, 102
- Brassocattleya Amberley, 124
  - Bloom, 124
  - Diadem, 124
  - Ditchling, 124
  - Eliaa, 124
  - Heatonensis, 124
- Brassolaeliocattleya Antoinette, 124
  - Appledore, 124
  - Eliza, 124
  - Orbit, 124
  - Royal Crusader, 124
  - Triune, 124
- *Bulbophyllum barbigerum*, 139

- *Cattleya* Acle, 120
  - Archimedes, 120
  - Arctic, 120
  - Ben Nevis, 120
  - *bowringiana*, 117, 119
  - Cades, 120
  - *citrina*, 107
  - *dowiana*, 117
    - var. *aurea*, 117
  - Duchess of York, 120
  - Fabia, 120
  - *gaskelliana*, 118
  - *intermedia*, 119
  - *labiata*, 117, 118
  - *lawrenceana*, 117
  - *loddigesii*, 119
  - *mendelii*, 119
  - *mossiae*, 117, 119
  - *percivalliana*, 119
  - Portia, 120
  - President Wilson, 120
  - Princess Royal, 120
  - *schroderae*, 117, 119
  - *skinneri*, 119
  - Thetis, 120
  - *trinae*, 119
- *Cirrhopetalum guttulatum*, 139
  - *medusae*, 139
  - *picturatum*, 139
  - *robustum*, 139
  - *rothschildianum*, 139
- *Cochlioda noetzliana*, 90, 103
  - *rosea*, 103
  - *sanguinea*, 103
  - *vulcanica*, 103
- *Coelogyne barbata*, 101
  - *balfouriana*, 137
  - *cristata*, 100, 101, 136
    - *lemoniana*, 100
  - *dayana*, 137
  - *fimbriata*, 101
- *Coelogyne flaccida*, 137
  - *lawrenciana*, 137
  - *massangeana*, 137
  - *media*, 137
  - *mooreana*, 101
  - *mossiae*, 101
  - *ocellata*, 101
  - *ochracea* 101
  - *pandurata*, 137
  - *pulchella*, 137
  - *speciosa* 137
  - *tripliculata*, 137
  - *valida*, 137
- *Cymbidium* Balkis, 86
  - Edzell, 86
  - *giganteum*, 83
  - *insigne*, 83
  - Jason, 86
  - *lowianum*, 83
  - Madonna, 86
  - Olympus, 86
  - Pearlstream, 86
  - Rusper, 86
  - Seaborne, 86
  - Stourbridge, 86
  - *traceyanum*, 83

  Torbay, 86
  York, 86
Cypripedium Albion, 99
  bellatulum, 126
  Blagrose, 99
  Bromilaud, 126
  Culmo, 99
  curtisii, 125
  Dramatic, 99
  Drayton, 99
  F. C. Puddle, 99
  fairieanum, 96
  hirsutissimum, 99, 126
  insigne, 95, 96
    sanderae, 96
  lawrenceanum, 126
  Madame Barbey, 126
  Madelon, 126
  maudiae magnificum, 126
  Minster Lovell, 99
  Moon of the Mist, 99
  niveum, 125
  Olivia, 126
  parishii, 99
  Psyche, 126
  Red Hackle, 99
  Rosy Dawn, 99
  villosum, 96
  Volcano, 99

Dendrobium Ainsworthii, 93
  aureum, 128
  Austinii, 129
  Berwick, 130
  brymerianum, 129
  chrysanthemum, 93
  chrysotoxum, 93, 129
  coelogyne, 129
  crumenatum, 129
  densiflorum, 129
  devonianum, 93
  falconeri, 129
  fimbriatum, 129
  Gatton Monarch, 130
  Gatton Sunray, 130
  gibsonii, 129
  Hanburyii, 130
  jamesianum, 93, 129
  Merlin, 130
  nobile, 93
  Thwaitesiae, 93
  thyrsiflorum, 91, 93, 129
  wardianum, 93, 129
  Zeno, 130

Epidendrum atropurpureum, 101
  ciliare, 101
  erectum, 102
  fragrans, 101
  obrienianum, 102
  prismatocarpum, 102
  radicans, 102
  radiatum, 102
  vitallinum, 101

Laelia anceps, 103, 120
    sanderiana, 120
  autumnalis, 103, 123
  crispa, 120
  flava, 103
  jongheana, 103
  pumila, 104
  purpurata, 120
  tenebrosa, 123
Laeliocattleya Albula, 123
  Aphrodite, 123
  Balkis, 123
  Elissa, 123
  Excellent, 123
  Golden Crescent, 123
  Jervis Bay, 123
  Jevington, 123
  Miriam Marks, 123
  Princess Margaret, 123
  Rusper, 123
  Victor, 123
  Windermere, 123
Lycaste aromatica, 106
  cruenta, 106
  deppei, 106
  skinneri, 106

Masdevallia chimaera, 104
  harryana, 104
  ignea, 104
  polysticta, 104

  schroderiana, 104
  shuttleworthii, 104
  veitchiana, 104
  xchelsonii, 104
Maxillaria grandiflora, 105
  venusta, 105
Miltonia Beethoven, 133
  Cardinal, 133
  Dawn, 133
  Flora, 133
  Melina, 133
  Nadia, 133
  phalaenopsis, 130
  Red Admiral, 133
  roezlii, 133
  spectabilis, 130
  Velvet charm, 133
  vexillaria, 130
  warscewiczii, 133

Odontioda Astoria, 91
  Gladys, 91
  Rosnant, 91
  Zenobia, 91
Odontoglossum Aristocrat, 91
  Berwick, 91
  cervantesii, 90
  citrosum, 89
  crispum, 87, 90
  edwardii, 89
  gloriosum, 90
  grande, 89
  Isfield, 91
  Palmyrus, 91
  Panther, 91
  Patmina, 91
  pescatorei, 90
  Princess Elizabeth, 91
  rossii var. *majus*, 90
Oncidium aureum, 94
  cavendishianum, 135
  crispum, 135
  fallens, 94
  forbesii, 94, 135
  kramerianum, 135
  loxense, 94
  macranthum, 94
  marshallianum, 94
  ornithorhynchum, 94, 135
  papilio, 93, 136
  phalaenopsis, 94
  tigrinum, 94
  varicosum rogersii, 93, 94

Phalaenopsis amabilis, 141
  Amphitrite, 141
  aphrodite, 141
  Artemis, 142
  Gilles Gratiot, 142
  lowii, 141
  rosea, 141
  sanderiana, 141
  schillerina, 141
  Vesta, 142
Pinguicula falcata, 60
Pleione humilis, 105
  lagenaria, 105
  maculata, 105
  praecox, 105

Selenipedium caudatum, 127
  dominianum, 127
  longifolium, 127
  grande macrochilum, 127
  roezlii, 127
Sobralia macrantha, 139
  rosea, 139
  sanderae, 139
  xantholeuca, 139
Sophrolaeliocattleya Amberley, 125
  Cicily Watson, 125
  Cleo, 125
  Sunburst, 125
Sophronitis grandiflora, 125
Stanhopea eburnea, 138
  insignis, 138
  oculata, 138
  tigrina, 138
  wardii, 138

Thunia alba, 108
  bensoniae, 108
  brymeriana, 108
  gattonensis, 108
  marshalliana, 108
  veitchiana, 108

winniana, 108

Vanda amesiana, 100
  Burgeffii, 134
  caerulea, 99, 100
  caerulescens, 134
  cristata, 134
  hookeriana, 134
  kimballiana, 100
  Marguerite Maron, 135
  Miss Joanquim, 135
  parishii, 134
  parviflora, 134
  Rothschildiana, 135
  sanderiana, 134
  suavis, 134
  teres, 134
  tricolor, 134

Zygopetalum crinitum, 107
  mackayi intermedium, 107
  maxillare, 107

INDEX

See also Index of Species, Hybrids and Varieties, p. 142. The figures in parentheses refer to the line drawings in the text.

Ants, 69
Aphides, 69
Atmosphere, 26–7

Bees, 70–1
Black spot, 71–2
Blinds, greenhouse, 31–2, (31)
Boilers for greenhouse, 16, 19, 22, 25
Bonemeal, 48
Brassavolas, 124, 138
Brassias, culture, of, 102, 136
Brassocattleyas, 124
Brassolaeliocattleyas, 124
Bulbophyllums, culture of, 138–9

Cattleyas, culture of, 107, 117–20
  hybrids, 120
Cirrhopetalum, culture of, 138–9
Cochliodas, culture of, 102–3
Cockroaches, 69
Coelogyne, culture of, 100–1, 136–7
Cool house orchids, monthly notes, 73–82
  temperatures, 28–9
Cultivation, 35–8, 41–4, 47–52
Cuprinol, 15
Cymbidiums, culture of, 83–6
  hybrids, 86
  repotting, 85–6
Cypripediums, culture of, 95–6, 99, 125
  hybrids, 126

Damping down, 26–7
Dendrobiums, culture of, 91–3, 127–30
  hybrids, 129–30
  repotting, 92
  shading, 92–3
  species, 93
Diseases, 66–7, 71–2

Electrical heaters, 21–2
Epidendrums, culture of, 101–2

Feeding, 47–8
Fertilizers, 48

Gas heating, 21–2
Glazing, (15), 16
Greenhouses, aspect, 11
  blinds, 31–2, (31)
  boilers for, 16, 19
  building of, 13–16
  construction of, 13–21, (14), (15), (20)
  conversion of, 11–13
  damping down, 26–7
  floors, 12–13
  glazing, 16
  heaters for, boilers, 16, 19, 22, 25
    electrical, 22
    gas, 21–2
    oil, 21
  heating for, 16, 19, 21–2, 25
  routine management, 26–32
  shading, 30–2, (31)
  sites for, 13
  staging, 12, 19–21, (19)
  temperatures, 11, 27–9
    cool house, 28–9
    intermediate house, 110
  thermometers, 25
  ventilation, 12

Heating for greenhouses, 21–2, 25
Hoof and horn, 48
Humidity, 26–7
Hybrids, *see* p. 142
Hybridizing, 57–9

Importing, plants, 48–50
Intermediate house orchids, 109–14, 117–20, 123–30, 133–40
  monthly notes, 111–14
  temperatures, 110

Laelias culture of, 103–4, 120, 123

INDEX

Laeliocattleya, culture of, 120, 127
  hybrids, 123
[illegible], 5–6, 111
Lycaste, culture of, 126

Manure water, 48
Masdevallia, culture of, 128
Maxillaria, culture of, 125–6
Mealy bug, 68–9
Miltonia, culture of, 120–1, 130, 133
  species, 133

Odontioda, culture of, 86–92
  hybrids, 92
  potting, 87–8
  ventilation for, 88–9
Odontoglossum, culture of, 86–92
  hybrids, 92
  potting, 87–8
  species, 89–92
  temperature for, 88–9
  ventilation, 88–9
Offsets, 22
Oncidium, culture of, 93–5, 135–6

Paphiopedilum, see Cypripedium, 98
Peat, 56–7
Phalaenopsis, culture of, 118–[illegible]
  species, 118–[illegible]
Phragmipedium, see Selenipedium, 127
Pleione, culture of, 124–5
Potting, 33–4, 45–[illegible]
Potting bench, 17–8
Potting compost, 39–[illegible]
  [illegible], 42

Propagation, [illegible]
Pseudo-bulbs, potting, [illegible]

Records of plants, [illegible]
Red spider, 68
Repotting, [illegible]
Resting, [illegible]

Scale insects, 68
Seedlings, cultivation of, [illegible]
  [illegible], [illegible]
Selenipedium, culture of, 127
Shading, [illegible], 111
Slipper Orchid, see Cypripedium, 95
Slugs, 66–7
Snails, 66–7
Sobralia, culture of, 129–[illegible]
Sophrolaeliocattleya, 121–2
Sophronitis, 121–2
Species, list of, 112
Staging, greenhouse, 12, 19–21, 111
Stanhopea, culture of, 137–8
Stocktaking, [illegible]

Temperature, cool house, 13–4
  intermediate house, 110
Thrips, 67–8
Thunia, culture of, 128

Vanda, culture of, 98–100, 133–5
  species, 134–5
Varieties, list of, 112
Ventilation, 22–3

Watering, 43–4, 47
Woodlice, 68
Wood preservative, 17

Zygopetalum, culture of, 107

Acc No. 57379

58378